FEBRUARY

25 CENTS

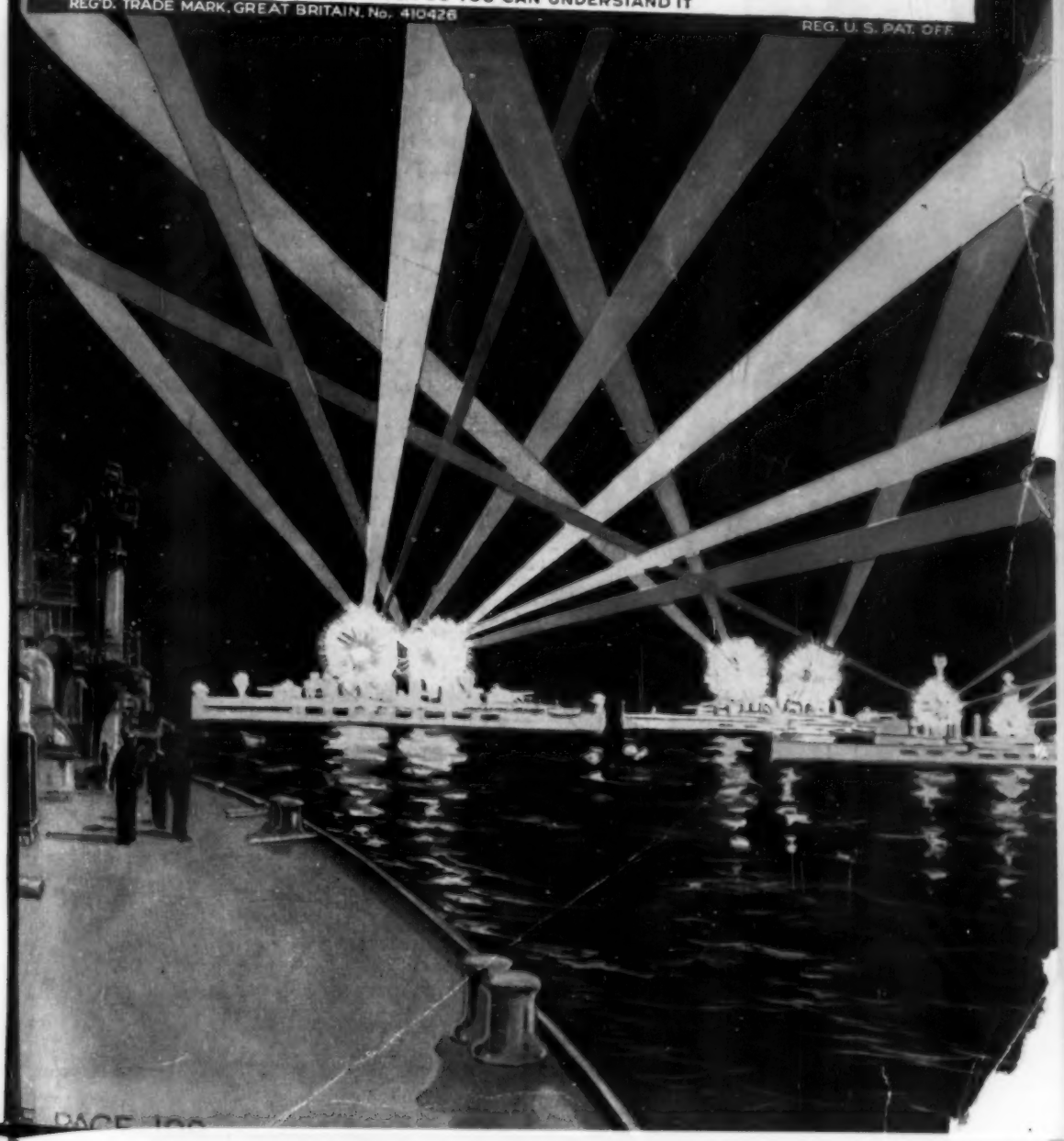
JAN 8 1924

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG'D. TRADE MARK, GREAT BRITAIN, No. 410426

REG. U. S. PAT. OFF.



Takes only 50 Days

to get a real job

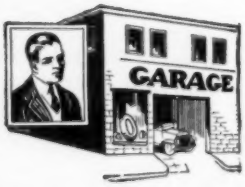
in the Auto and Tractor Business

THE GREAT RAHE SCHOOL

Read what these men are doing—here is your big chance to get "on easy street." Come to these great shops on the biggest FREE offer ever made.

Big Firms Need Trained Men

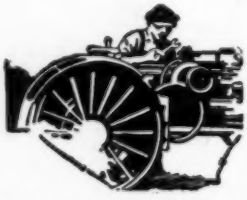
The Auto and Tractor Business is on the boom. Thousands of trained men will be needed during the next few months. I get calls every day from Garages, Battery Stations, Auto Repair, Welding Shops and other successful concerns for Rahe men. When the big fellows need high grade men they know where to come for them. They want Rahe trained men.



"My garage and Ford Agency is a big success. I owe it to Rahe training."—G. Smith, W. Alexandria, Ohio.

My Training Unusual

Scientific tool training—that's the secret. You do things here according to the latest engineering standards. Thousands of dollars have been spent in modern tools and equipment. That's why my men are at home with the biggest shops in the country. If you want to succeed the way Smith and Metzger and the rest have—qualify by the same method.



"Rahe training was the best investment I ever made."—Colby Lord, Oakland, Maine.

I'll Pay Your Railroad Fare and Board You!

In order to fill the openings that now exist, I am making an offer no one has ever made before—**Free Railroad Fare. Free Board.** But even that is not all. I'll tell you about the rest in my letter.

Send for FREE Book My big illustrated training book tells how others are succeeding. It tells many things you ought to know about Autos and Tractors. Write for it and my **short time** offer NOW. It soon expires.

Rahe Auto Tractor and Electrical School

Dept. 141 Ninth and Walnut Sts., Cincinnati, Ohio

"I thank Rahe Training for a great job in the best garage in Lima."—Howard Metzger, Lima, Ohio.

Rahe Auto & Tractor School

Dept. 141, Ninth and Walnut Streets, Cincinnati, Ohio

Without any obligation, send me your big free book "The Evolution of Transportation." Also information regarding special temporary offer.

Name.....

Street.....

City..... State.....

"THE AIR IS FULL OF THINGS YOU SHOULDN'T MISS"

Eveready "Three," 4½ volts, three distinct uses. Length 4 in.; Width 1⅝ in.; Height 3 in.; Weight 14 oz. At all reliable radio dealers.

This "C" Battery is a Wonder Worker

YOU can make the loud speaker respond with a new fullness and naturalness of tone. You can save money by adding months to the life of your "B" Batteries. These things you can do by using the new Eveready 4½ volt "Three" as a "C" Battery.

You already have an "A" Battery for the filament and a "B" Battery for the plate. A "C" Battery is connected to the third element of your vacuum tube, the grid, affording a control that is marvelous in action on audio frequency amplifiers.

As a "C" Battery the Eveready "Three" prevents distortion and excessive flow of current from the "B" Battery, lenghtening its life. It is a wonder worker that saves its small cost many times over. Connect it in your audio frequency amplifier and note the difference. Full directions on the label and in "How to Get the Most Out of Your 'B' Battery," a booklet on "B" and "C" Batteries, sent free on request.

This triple-use battery can also be used as an "A" Battery in portable sets. Light and full of pep. Its third use is as a "B" Battery booster.

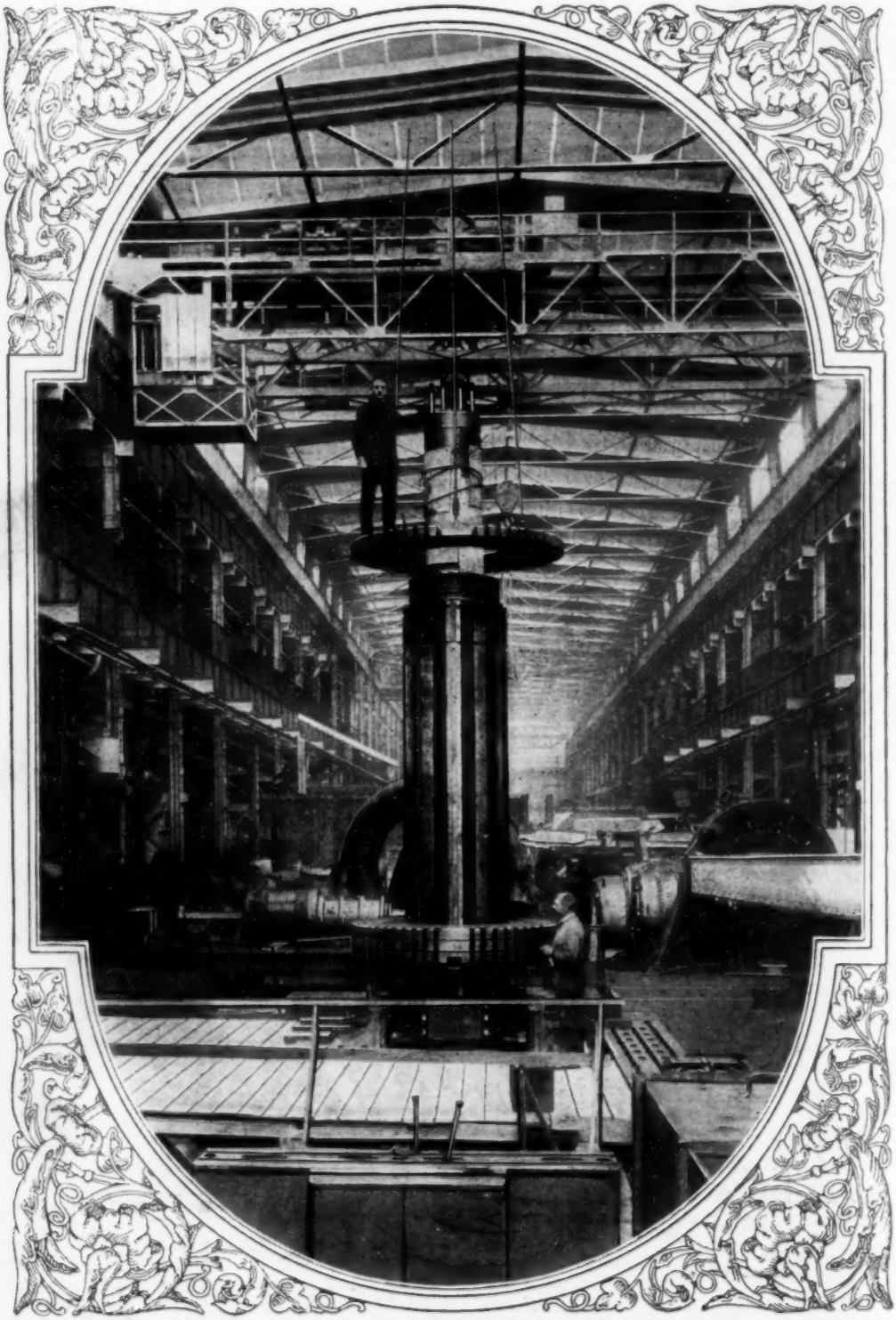
Use the Eveready "Three"—a tested product of the world's leading electro-chemical battery laboratory. It serves more radio uses and effects more economies than any radio battery heretofore developed.

If you have any battery problem, Radio Battery Information Headquarters will solve it for you. Write G. C. Furness, Manager, Radio Division, National Carbon Company, Inc., 207 Manley St., Long Island City, New York.

NATIONAL CARBON COMPANY, Inc., New York and San Francisco
Headquarters for Radio Battery Information

CANADIAN NATIONAL CARBON CO., Limited. *Factory and Offices:* Toronto, Ontario

EVEREADY
Radio Batteries
—they last longer



Putting the Finishing Touches on a Great Turbine Shaft in a German Erecting Shop—a Real, Man-Sized Task, Calling for the Highest Degree of Skilled Craftsmanship

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE

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Vol. 41 FEBRUARY, 1924 No. 2

Army of Craftsmen Bulwark of Nation

By JAMES J. DAVIS

United States Secretary of Labor

THE dignity of labor has been the subject of unusual discussion ever since the time of the carpenter of Nazareth.

But, due to false ideals, misguided conceptions of service, and wrongly interpreted ambitions, today the desire of many to enter the trades is being thwarted by a mistaken impression that work of the hands is to be despised.

This has resulted in an increasing drift toward "white collar" occupations. Even some professions are being overcrowded with young aspirants who possess inherent, but suppressed, tendencies toward lines of endeavor that require the utensils of the artisan rather than the "book learning" of higher education.

Craftmanship is a vital need of the nation. More than 90 per cent of our population is made up of farmers and industrial workers. Less than 10 per cent, it has been pointed out, are in professional life. And yet, while millions are being spent for education, little of it is going to teach boys to use their hands in a useful way.

Why train 100 students for professional activities, when only one in every ten can possibly hope to make an adequate living in these lines? Probably this is due to false pride and the idea that work with the hands is menial and degrading. And yet it is upon the flannel-shirted army of hand toilers that the responsibility ultimately rests for the nation's property and social and economic progress.

With the restriction of emigration, the opportunities offered by the trades are greater now than ever before. While there is an oversupply of slide-rule engineers and bookish lawyers, every craft is crying for workers and apprentices at record-breaking wages. For instance, in 1910, according to government figures, there were 817,120 journeyman carpenters in this country and 6,069 apprentices—136 journeymen to each apprentice. Ten years

later there were 887,000 journeymen to 4,805 apprentices. As the population of the country increased 15 per cent during the same period, it is clear that the carpenter's trade is losing ground, although wages have been more than tripled. Then again the introduction of materials exterior to the woodworkers' calling into the building industry may help to cause the decrease. But, the crying need of the market for such craft contradicts that, in a measure.

With plasterers, the finished craftsmen numbered 47,682 in 1910 and dropped to 38,225 in 1920—a loss of 9,457 workers. And here change of material has not affected the demands for skill. On the other hand, with demands for brick and stone masons constantly increasing, there was a loss of 38,138 men from 1910 to 1920. Painters, glaziers, and varnishers doing building work also showed losses. The single exception to this situation was in the electrician's craft where the number of workers increased from 120,155 a decade ago to 212,964. Here the general growth of electricity has added the recruits to the ranks. Factory and household, and railroad and marine transportation afford to it a marvelous field that appeals because of its problems and possibilities.

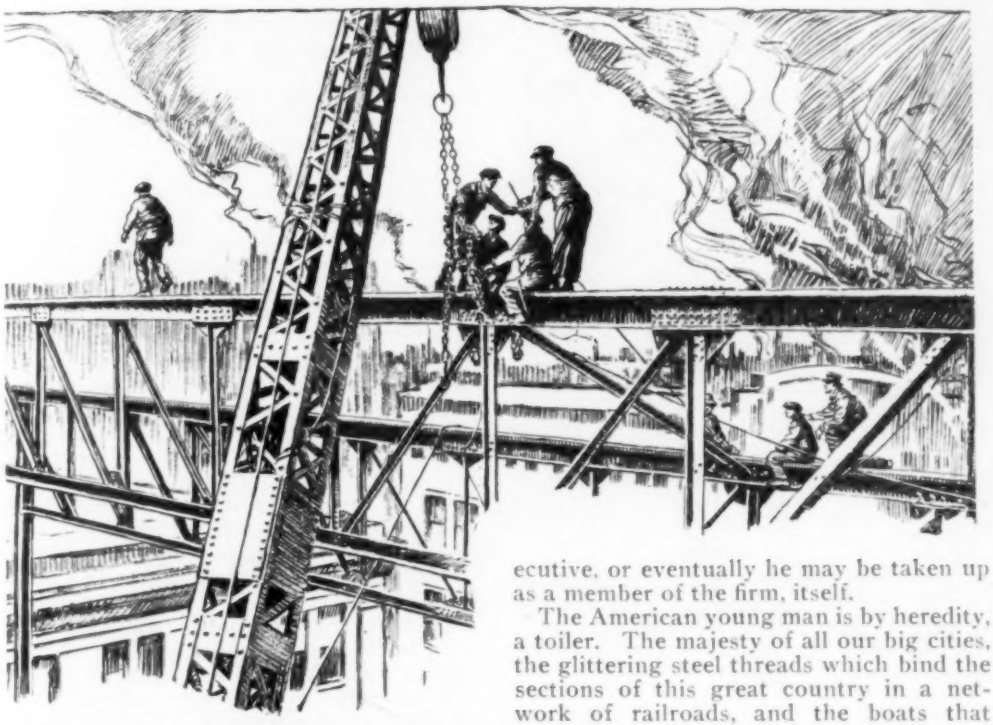
Probably there will always be those who believe in letting their brains keep their hands soft, even at an economic loss, forgetting the age-old truth that man has always been blessed in the work of his hands. Carnegie started as a telegraph messenger boy. Edison was a train "butcher." Schwab carried water in a steel plant. Ford was a stationary engineer and a machinist. Lack of a college education, or so-called "higher learning" did not stop their rise to fame, fortune, and riches. Nor did it interfere to any visible degree with the accomplishments of such men as Luther Burbank.

With libraries, night schools and correspondence courses everywhere available, no youth need feel handicapped by the lack of university training, because, with proper industry and ambition, he can obtain its equivalent and at the same time get an earlier start in the race toward success and worthwhile achievement. What the world needs is practical men—workers who can supply the constantly increasing demands of civilization.

To the adventurous, even, manual toil offers thrills which rarely come to men outside of the labor world. Who will deny that all the daring, all the sensations, and all of the delights of the professional mountain climber, are not experienced every day in the life of the structural iron worker who looks down upon us from a perch on a lofty steel skeleton of a big city sky-scraper? Who among us would not give a great deal to feel the throb of the giant engine that lifts tons of stone and timber, in the twinkling of an eye, to the men with hammers and trowels, plying their trades up near the clouds. To the man on the street, it is a breathless moment as the heavy mass goes sailing upward, yet, the stationary engineer who controls the lever of the hoist by dint of training and experience, commands the movement that elicits the onlookers' praise.

Romance awaits the recruit to the service of the hands. Therein lies happiness, a gratifying return in consciousness of power to create beauty from the rough, and a remuneration never before equaled in the history of toil. Freedom of body and soul are there, too. With the merry din and rattle of the tools of manual labor, there comes peace to the mind, leaving it to dwell full on the task, and exercise of the body fabric is reflected in better health, clearer eyes, and more ruddy cheeks than has he who has given himself to confined effort of mind alone within the narrow walls of an office.

In the trade school, the young man who loves mechanics will obtain a foundation upon which to build a career that will be of the greatest value. He will acquire dexterity in the use of tools and a knowledge of the operation of trade machinery. He will obtain a knowledge of trade theory and of drawing. With these advantages, he



will be of real value to his employer from the outset. Speed of execution and facility come only with the experience obtained in actual trade employment. An alert mind in command of dexterous hands is a factor that defies defeat. Attainment of its object, is merely a matter of time and application. Couple with this, then, natural business qualities, and they are frequently found in the trades, and we have a combination that halts only when the highest rung of the ladder has been reached.

If the young man does not take a trade-school course, the chances are that he will have to "pick up" his trade as best he can during an apprenticeship period, because the employer does not have the time to personally supervise his training and the foreman or workman under whom he works may have no personal interest in seeing that the apprentice becomes a good mechanic. Thus, it is likely that he will be kept at one kind of work indefinitely, and by the time he has served his time, he will be more of a specialist than an all-around workman.

While all of the skilled trades offer excellent livelihoods to the expert and dependable mechanic, advancement is certain if he has or acquires the ability to direct other men and lay out work. In the latter case he may become a foreman or an executive, or eventually he may be taken up as a member of the firm, itself.

The American young man is by heredity, a toiler. The majesty of all our big cities, the glittering steel threads which bind the sections of this great country in a network of railroads, and the boats that plow their way through the rivers, are but the labors of our fathers. Wherever man has placed one stone upon another or riven log upon log, there is an expression of the greatness and dignity of the work of the hands.

In Egypt, great pyramids of stones, colossal in size, have defied the warring elements of time, and have communicated to modern civilization a silent counsel from a once lordly people, a race that worked with its hands. What if these massive piles of hewn and joined rock were raised to memorialize the pomp of dead rulers? Labor built them. And it is of labor that the observer thinks when he contemplates their mysterious origin after thousands of years in the midst of barren wastes whose very atmospheres are painful to ordinary men.

During the past few generations we have built the best system of schooling that has ever been devised. But in spite of our tremendous strides, we have allowed the convictions to grow, that education is a substitute for work, rather than a tool to work with; that merely a good education should provide the means of life and happiness. The dire conviction that an education unfits a man for work that must be done with his hands has been permitted in the very face of a world that is crying aloud for doers.

The educational advance has been rapid, but it has been all in one direction. The practical need has almost been ignored, and excluded in mistaken efforts toward absorption of classical knowledge.

The ultimate end, with such a system, if it be permitted to continue without correction, would be the creation of a nation where every citizen would have the learning of books, and none would have the learning of the hands which is vital to the progress and prosperity of any country. The American artisan, when he is properly trained, excels in every way the efficiency of the natives of every other nation. However, there is no reason why proper attention should not be paid to both the hand training and the education of mind, combining both to the end that one can help and direct the other.

Now that labor of the hands has risen to monetary value beyond the fondest dreams of workmen of a half-century ago, material reward is assured the beginner who enters upon a career of manual toil. He first should have primary instruction in the needs of the everyday man as a foundation for the more serious task of absorbing knowledge of greater and more immediate return. His way should be chosen in keeping with his proclivities and natural leanings. If woodworking, such as cabinet making, appeals to him, steps should be taken to provide him with the instruction that promotes early progress in the art. If it is steel that calls to him, a chemical course of sufficient volume should be accorded him to acquaint him with the fabrication of that metal. In short, the idea should be to place the student-apprentice on familiar terms with the material he chooses as a background for his career. Stone, brick, wood, paper, and cement all have wonderful stories for the youth who allies himself with them. And what better can be done for the eager mind than to permit the laboratory and the school to impart this preliminary information? Armed with these romantic histories that daily grow in marvel, the energy of mind is augmented by the abilities of the hands in the shaping of the masses into beauty of architecture and strength of commercial and industrial equipment.

It is but a step from the exercise of genius to the sweat of the brow. The "white collar" and the "boiled shirt" should not beguile youth, falsely, from the thrum of industry and the strident song of steel and wood. The man of labor has not attained dignity—he never lost it. His march is still upward. The overall remains a royal raiment and as Solomon of old called to the King of Tyre for skilled artisans to raise temples toward the heavens, so today does the world cry out for the denim-clad doers—blessed workers with hands.

James J. Davis

HOUSE WALLS OF PACKED SOIL MAY REDUCE BUILDING COST

Revival of the use of earthen walls for houses, a practice known several thousands of years ago, may greatly reduce the cost of homes of today, is the opinion of a government scientist studying the process. Such structures are made of earth tightly packed and "cure" in a short time. The method, he says, produces a building that is not only sturdy in construction but is warm in winter and cool in summer. Houses erected of soil have been known to become so strong in a few months, that to cut openings in the earthen wall required the same tools used to penetrate rock. Structures of the kind put up 200 years ago have practically turned to stone, in imitation of the work of nature in forming hard substances from exertion of great pressure on sand and clay mixtures. "Rammed earth," as the material is called, needs little treatment and can be prepared by unskilled persons. Its cost is but a fraction of that of brick, wood, or concrete.

TOY BALLOON TRAVELS FOUR DAYS OVER ATLANTIC

A small balloon floating in the Atlantic Ocean several miles off Pemaquid Light, Maine, was discovered by the editor of this magazine while on a recent cruise. The balloon which was about two-thirds its original size, bore the legend, "Souvenir Cortland County Fair, 1923." As there is no county by that name in Maine, Mayor Hollister, of Cortland, N. Y., was written to among other Cortlands, and the fact was mentioned in a local newspaper. As a result correspondence was had with Mr. and Mrs. O. W. King of that city, ending in the identification of the balloon and the tag attached to it as undoubtedly the one which had escaped from the hands of their four-year-old daughter, at the fair. The balloon was picked up on the afternoon of August 25, 1923, which was almost four days after its escape, during which time it must have traveled at least 300 to 400 miles. It now rests in this magazine's museum.

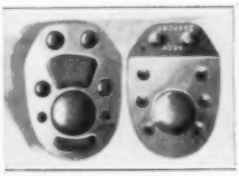
CHURCH WITH FOLDING STEEPLE AND RADIO RUNS ON WHEELS

For doing missionary work in out-of-the-way places a miniature house of religious worship has been mounted upon the chassis of an automobile. This little traveling temple is fully equipped with everything that can further its mission: radio, for the entertainment of the audience, a drop platform for the minister, and a collapsible spire terminating in a cross which is lighted at night by electricity generated in a storage battery. It is nondenominational in its teachings.

Church on Automobile Chassis that Has Folding Spire and Radio for Its "Congregations"

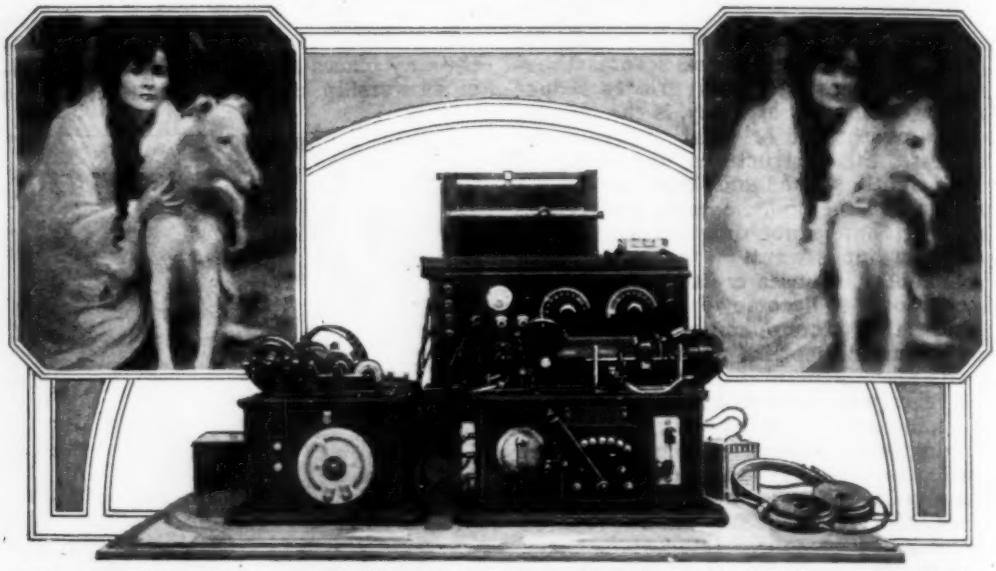
RUBBER HEEL TO HELP ARCHES HAS BALL-CUSHION TREAD

To support the arches and give spring to the step, a rubber heel with a hollow ball cushion in the center of the tread has been made. The front is beveled toward the sole of the shoe, and is equipped with two small knobs, which are said to be helpful to those having trouble with the bones of the feet. Due to the perforations in the upper side, these articles are very flexible. They come in either brown or black stock.



¶ More than 300,000,000 envelopes are expended in handling the business of the United States government each year.

PHOTOS SENT THROUGH AIR BY RADIO OR OVER WIRE



Picture, at Right, as It Appeared after Being Flashed through the Air by Radio, and, at Left, as It Originally Appeared. The Apparatus Used Is Shown in Center

Flashed through the air just as the radio broadcasts songs or stories, or dispatched over wires as messages are relayed by telegraph, photographs of important events or of criminals and their signatures or fingerprints may be sent hundreds of miles and exactly reproduced on an instrument perfected by an eastern newspaper man. The apparatus consists of two identical machines closely resembling radio sets, one for transmitting and the other for receiving. A zinc or copper print is prepared from the photograph, the lines running from left to right. This is placed on the cylinder of the sending machine, made to revolve, and a needle passing over the surface opens and breaks an electric circuit. These impulses, flashed over a wire or broadcast through the air, are recorded on the receiving instrument, which has a cylinder revolving at exactly the same speed as that of the transmitter. The impressions are traced on chemically treated paper so that an exact duplicate of the original plate is obtained. The outfit is portable and has been used to send photographs 900 to 1,000 miles by radio and nearly 400 miles by wire.

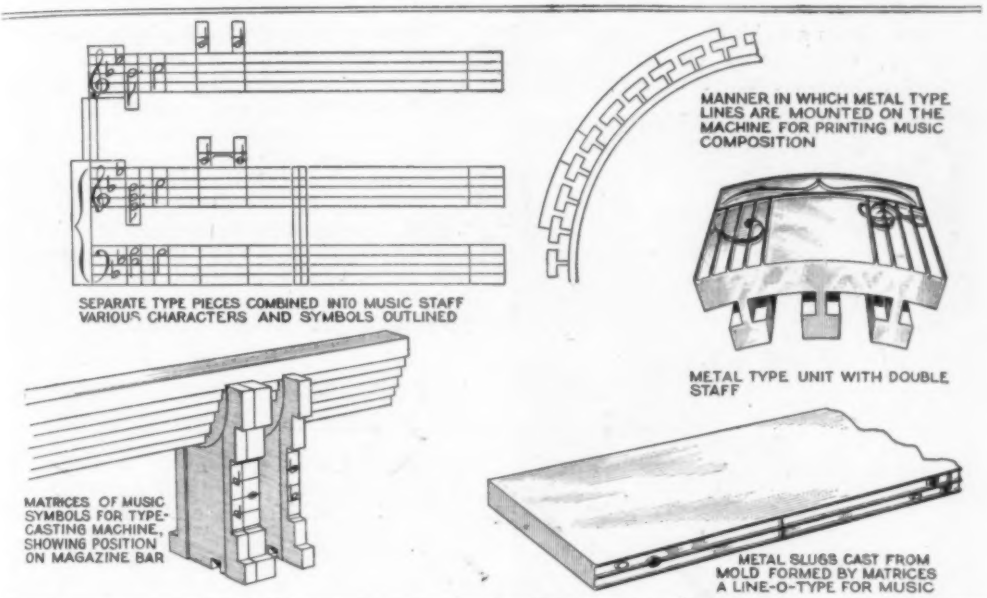
Snug Jackets Button Tightly Around Gear Pedals and Clutch to Keep Out Cold

PEDAL JACKET ON SMALL CARS EASES WINTER DRIVING

To prevent cold air, snow, and water from entering small cars through openings near the clutch and brake pedals, a jacket of soft rubber sheeting, which fits securely about the parts and under the regular floor mat, has been placed on the market. The covering is buckled quickly in place and does not interfere with the operation of the car.

¶Popular Mechanics Magazine does not publish the name of maker or seller of any device described in its pages; but this information is kept on file and will be furnished free by addressing our Bureau of Information.

SETTING "TYPE" FOR MUSIC TASK OF MACHINE


SEPARATE TYPE PIECES COMBINED INTO MUSIC STAFF
VARIOUS CHARACTERS AND SYMBOLS OUTLINED
MANNER IN WHICH METAL TYPE LINES ARE MOUNTED ON THE MACHINE FOR PRINTING MUSIC COMPOSITION
METAL TYPE UNIT WITH DOUBLE STAFF
MATRICES OF MUSIC SYMBOLS FOR TYPE-CASTING MACHINE, SHOWING POSITION ON MAGAZINE BAR
METAL SLUGS CAST FROM MOLD FORMED BY MATRICES A LINE-O-TYPE FOR MUSIC

Engraving costs and expenses in connection with the hand-setting of type characters for the printing of music are expected to be eliminated by a process that sets the notes and symbols in their required order as they come from a typecasting machine. After it has been "locked up," the form may be used either on a power press or adapted to one of the smaller hand devices, provided either has a curved cylinder on which the composition can be placed.

In spite of the fact that the hand process requires about 3,000 characters, it is claimed that the mechanical method will employ not more than 25. Each piece of type under the recent plan will consist of the symbol and the lines of the staff and will form a perfect union with those preceding and following it. Since the ordinary alphabetical characters seen on all typesetting machines will not be interfered with during the composing of the musical form, the words of the piece can be set at the same time, in position corresponding with their notes.

It is believed that the perfection of the machine music-setting system will open up a new branch of the printing industry, as well as permit a composer to publish his own matter. The number of copies that can be run off a form will be limited only by the life of the metal.

The characters are molded from the ordinary metal in use with typesetting machines, and are produced in the usual "slug" shape. Where the rotary cylinder is to be used for printing, the characters are curved, with T-shaped flanges to fit in the grooves that hold them in position on the drum. The paper stock can then pass under the revolving form, or the cylinder can be made to move across the paper.

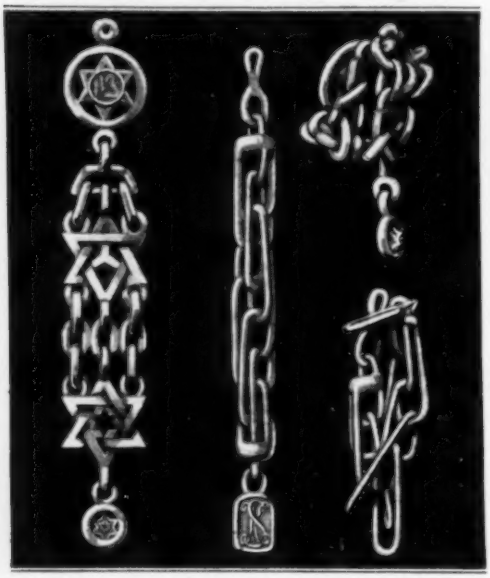
RED BACK OF THERMOMETER AIDS QUICK READING

With a broad strip of bright red glass back of the mercury-filled bore, a legible and accurate thermometer, now on the market, can be read at a glance. As the column of silvery liquid moves up or down, it hides or exposes the brilliant background. The temperature readings are plainly recorded at the bottom of the scarlet streak which contrasts sharply with the metallic gray of the fluid. The instrument is said to be more accurate than those with colored liquids of various kinds. The figures are large, and distinct, and can be seen from almost any angle, making it unnecessary to turn the device about in order to learn the reading. The red line extends from the top down to the bulb, and forms the rear of the channel of the tube.

¶With the largest lighthouse organization in the world, the United States maintains 16,373 aids to navigation

FOUR MONTHS TO CARVE CHAIN FROM BLOCK OF WOOD

Carved from one block of wood, a watch chain of complicated design has been turned out by an artist who spent four



Watch Chains Carved from Single Pieces of Wood that Required Many Months to Complete

months on the task. Small enough to fit into the palm of the hand, it is perfect in every detail and without a single mark of a tool. Other similar chains required three weeks in the making. One of them carried a six-pointed star which interlocked with a double triangle and pendant.

POCKET SEAL IN WATCH CASE HELPS PUBLIC NOTARIES

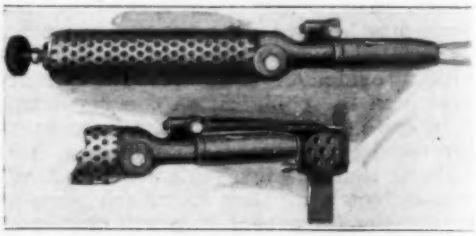
As easily carried in the vest pocket as a watch, which it somewhat resembles, a seal has been made for public notaries and other officers whose duties compel them to take legal acknowledgments at a distance from their places of business. Replacing the usual bulky device, this convenience is built into a strong, closed case, finished in gold plate over a heavy metal base.

LONG TELESCOPE FOR CAMERA TO LEARN STAR SECRETS

Accurate measurements, by means of a huge photographic telescope, 36 feet long, to determine the direction of the stars' movements, are planned by scientists of an eastern university. An expedition equipped with the tube, said to be the third largest in the world, is preparing to go to points in the southern hemisphere where atmospheric conditions will be favorable to the task. Included in the outfit is a camera with a 26-inch lens. Data to be obtained are expected to clear up some perplexing problems of the skies.

BIT FASTENED TO BLOWTORCH FORMS SOLDERING IRON

Fastening a detachable bit to the nozzle of a blowtorch now on the market, converts it to a soldering iron. The head can be placed either in a straight position or at right angles. Gasoline is used to produce the flame and is stored in the hollow handle. In order to protect the hands against excessive heat, the grip is composed of a perforated metal shell, which forms a cover for the fuel tank. The entire soldering head can be removed by loosening one screw, and unfastening another permits the point to be taken out.



Blowtorch that Becomes a Soldering Iron with the Addition of a Detachable Tool

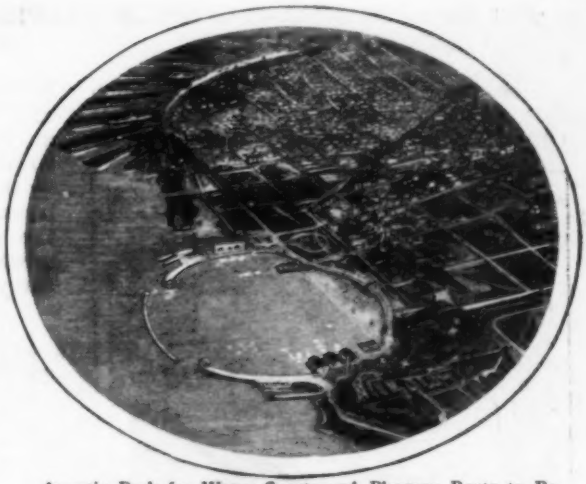
The device is especially convenient in electrical and automobile-repair work.

BLUEBERRIES BIG AS GRAPES RESULT OF CULTIVATION

Tamed, and taught to grow under cultivation, the shrub of the wild swamp huckleberry of New Jersey has been improved until it yields a fruit as large as a grape. The seeds have grown smaller, but the flavor and sweetness of the new product have been increased. To distinguish it from the wild upland variety, it is now called "blueberry."

BIG PARK FOR WATER SPORTS TO BE BUILT IN WEST

With a protective harbor for pleasure boats, an aquatic park is to be built soon near the old exposition site in San Francisco. The basin will be about 1,500 feet in diameter, with a maximum depth of 30 feet, shoaling gradually to the beach. Two curving stone piers, each with a pavilion and light at the outer end, will supply protection, and a reinforced-concrete breakwater will span the outer gap, leaving a channel at either end, and furnishing a pool for every variety of sport, including boat races.



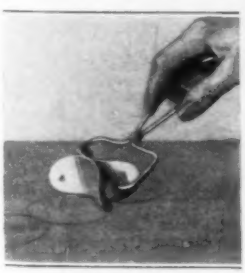
Aquatic Park for Water Sports and Pleasure Boats to Be Constructed at San Francisco

MILLION HOMES FOR WORKMEN NEEDED IN THE U. S.

About 1,000,000 more houses are needed in the United States to relieve the present shortage, investigators studying the problem report. In spite of the various "building booms" in many parts of the country, only one city shows a surplus of residence buildings. It is held that the type of houses for the workingman must be changed, so as to bring about cheaper construction. This alone, it is said, would increase the proportion of home-owners by 30 per cent. Building codes, it is contended, must also be modernized.

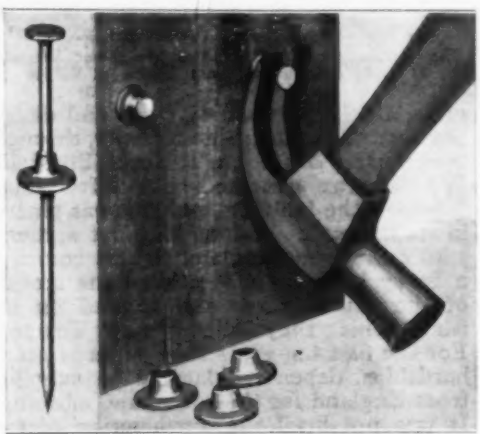
BISCUIT CUTTER WITH CURVED KNIVES ROLLS OVER DOUGH

Two curved blades on a biscuit cutter recently placed on the market give the utensil a wheellike motion as it is passed over the dough. With each complete revolution the knives cut out a perfect circle. The tool is of use in making cookies, muffins, and other small, round cakes. Its strong, light construction permits it to be drawn back and forth with very little effort, and it is plated to prevent rusting.



METAL COLLARS ON NAILS SAVE LUMBER AND WORK

To avoid waste of lumber used in concrete forms, scaffolding, and the like, a metal collar that slips over the body of the nail and makes it easy to draw, has been patented. The device tapers to a diameter smaller than that of the nail head, and insures the claw hammer a good grip. It gives additional rigidity where used, and saves times in dismantling.



Metal Collar Slipped Over Body of Nail Makes Pulling Easy and Saves Lumber

¶So great was the popularity of the nickel last year, that the Philadelphia mint alone turned out approximately 30,000,000 of the small coins.

FRAGMENTS OF OLD CHURCH BECOME SOUVENIRS

Remains of the old brick tower, which formed the fortress portion of the first church edifice erected in Jamestown, Virginia, are fast crumbling away and disappearing. This magazine recently, through the courtesy of George T. Boski, Bluefield, W. Va., was presented with a few fragments of the building, which it has placed in its museum. Among the first settlers, who came from England to this country, a hardy band in 1609 entered the mouth of the James River and located on an island which they called "James Towne." For the first ten years they suffered great hardships, depending largely on supplies from England for their food and clothing. It was not until the introduction of tobacco-growing as a business that they began to prosper. The early date of the founding of Jamestown insures the fact that the old church tower is among the oldest, if not the oldest, structure of its kind in the eastern tier of states.

Bits of Church Tower Erected at Jamestown, Virginia, in 1609; Bouquet of Vines Grown on Edifice

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¶ Living in the larger Chinese cities is generally hand-to-mouth. Food is purchased from so-called restaurants, and hot water is sold by dealers who specialize in it.

"HEAT MILL" SAVES ORCHARDS FROM BLIGHT OF FROST

To save orchards from frost, a "heat mill" has been developed that consists of an airplane engine, propeller, and a distributer through which the wind stirred up by the whirling blades is forced under the trees. The device may also be used to cool the atmosphere when the heat is too great. The machine is expected to replace many of the smudge pots.

TEN THOUSAND PRAYERS "SAID" BY WHEEL IN A SECOND

Buddhist priests, or lamas, of Tibet say as many as ten thousand prayers a second with the aid of a revolving wheel. The supplications, closely printed on long strips of paper wound tightly inside a cylinder, are considered "said" each time it revolves.

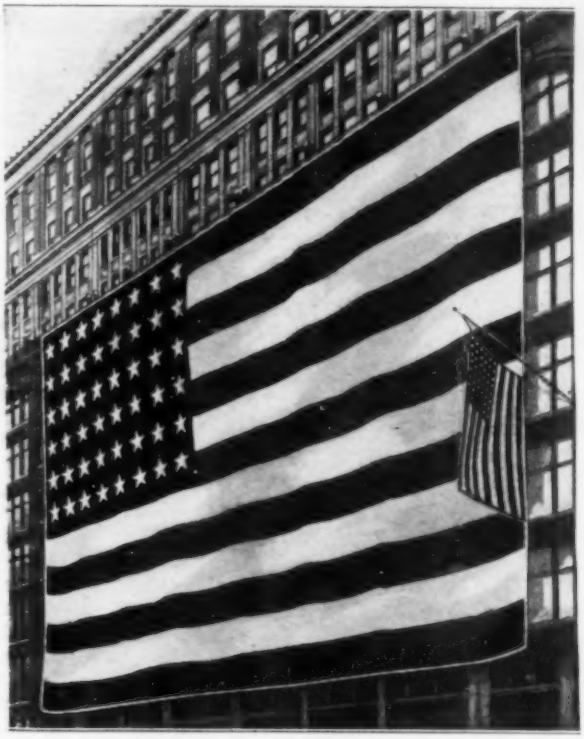
COLORED PAPER SERVES AS INK FOR HAND EMBOSSING PRESS

To emboss showcards and other stiff paper, without the use of heat, glue, or ink, a hand press, said to operate at a fraction of the cost of printing, and which needs no expert feeders, has been recently made. Brass type furnished with the machine can be set up in an easily locked form by inexperienced persons. The cardboard and sheets of paper of the color desired are inserted in the device. Pressure on a lever causes the press to close down on the papers, cutting out the letters and fastening them to the background.

Hand Embossing Press that Prints Letters in Colored Paper and Needs no Expert Operator

FLAG SO LARGE IT COVERS FRONT OF BUILDING

During a celebration recently held in a mid-western city a large American flag was unfurled down the side of an office building, hiding almost the entire wall of the structure. Each stripe of the gigantic "Old Glory" was nearly 7 feet wide. The blue field measured little less than 50 feet square and the entire emblem was 90 feet wide and 150 feet long. It was stretched between two heavy ropes and was fastened to the building every few feet to prevent damage by winds. Beside it a flag of ordinary size was placed. This was completely dwarfed by the larger one.



Almost Concealing Front of Large Building, this Giant "Old Glory" Marked a Recent Celebration

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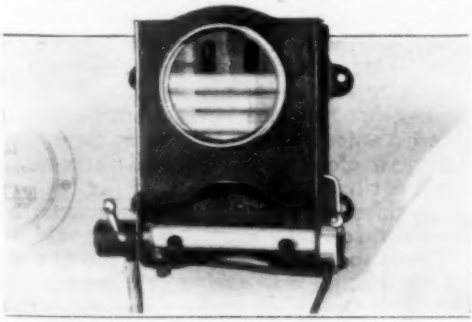
¶Scientific care of terrapin has been so perfected that the death rate is said to be lower during the first year than it is among chickens on the average poultry farm. In recent experiments, special attention was given to the production and proper handling of the specimens and the best method of hatching the eggs.

CIGARETTE CASE FOR AUTO ADDS LIGHT AND PUFFS

Lighting a cigarette before it is taken from the holder is a service rendered by a container for fastening on the instrument board of an automobile. The device, which was recently put on the market, operates from the battery and engine of the car. A turn of a small spring lever delivers a cigarette from the supply compartment into a groove where, by a slight pull on another handle, one end is pressed into a suction tube and the other end against an electric lighter. At the same time current is started into the heating unit and air is drawn through the "smoke." After a few puffs the tobacco is lit and ready for the smoker. By eliminating the need of attention from the driver, the device is said to make slowing up of the car unnecessary and to prevent risk of accident from neglecting the wheel while lighting with a match.



Cigarette Case for Automobile that Lights and Puffs "Smoke" Until Removed by Motorist

SAND LIBRARY AIDS BUILDERS IN CHOICE OF MATERIALS

Accessible to builders and contractors who want to know the value of various grades of material for construction purposes, a "library" of 2,800 bottles of sand, each marked with the results of tests to determine the suitability of the samples for commercial purposes, forms an important part of the scientific collection of a Chicago school. Specimens of sand from practically every state in the Union and from foreign countries have been gathered during the ten years since the "library" has been compiled. Records have been kept and pasted on the bottles as to the source of the material and grading.

Luther Burbank, the "Plant Wizard," Is Still Poor After Making Others Wealthy

Luther Burbank.

By H. H. DUNN

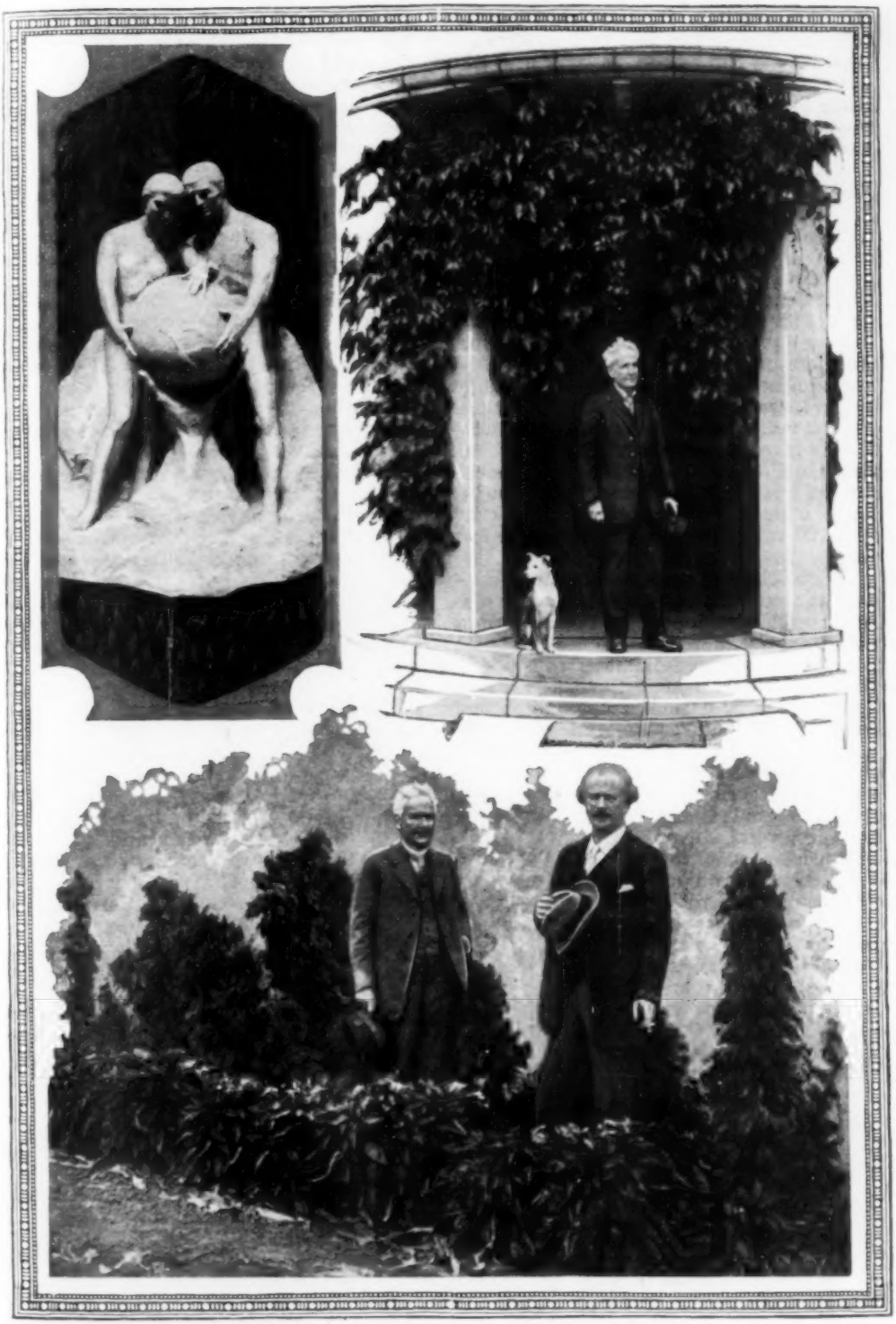
MOST men making millions for themselves carry other men into fortunes with them. But it is doubtful if there is more than one man in the world who, from his own creations, in one of the least explored fields of human endeavor, has piled up millions for other men and, at the same time, little more than a livelihood for himself.

To have done this willingly, to have sought the satisfaction of the sower, rather than the remuneration of the reaper; to have seen the ripened grain from his cultivation piled in the granaries of others, and yet to be contented with the knowledge that by his work the world has been made largely better as a place in which to live, is the story of this man's life, which this year passed the third quarter of a century. He is Luther Burbank, often called the "weed wizard," but who would be renamed the "plant philanthropist," were his lifework better known.

Probably from the time Burbank sold his first plant development, the potato which bears his name, for $150, through all the fifty years of his activities along these lines, he has actually given away more in dollars and cents than any other man who ever lived. Yet he is today comparatively a poor man, while all around him, from the wheat fields of the Saskatchewan to the cotton plantations of Louisiana, and from the apple orchards of New Hampshire to the plum groves of California, hundreds of thousands of dollars of increase in the value of more than 2,000 products of the soil are pouring every year because of his efforts.

It is estimated that his addition of two grains to an ear of standard wheat has added more than $5,000,000 to the annual wheat crop of the world. He reduced the size of the pit in a plum, and from two valleys in the West last year there went out more than half a million dollars' worth of these plums, larger in meat, finer in flavor, better equipped to resist shipment and change of climate. The artists of France wanted a flaxseed which would furnish a pure white oil for their paints. Burbank produced it, and increased the oil content by 20 per cent. The Japanese producers asked him for a mulberry tree which would furnish better and more food to the leaf for their silkworms. He evolved such a tree, with leaves three times the size of those of the then-known mulberry, and, just for good measure, brought it to development in two years, instead of the seven to ten years the best of the old-time mulberries required.

Ever since men have had feathered chickens, and jewelers have made delicate chronometers, sunflowers have been grown to produce seeds for the fowls and oil for the instruments. But all sunflowers—until Burbank showed them the error of their ways—grew on tall stalks and turned their faces to the sun, devoting most of their energy to getting up into their places in the sun, and the small remainder to producing seeds. The plant philanthropist took several sunflowers on his botanical knee and taught them first, to grow close to the ground; second, to devote their strength to seed production; and, third, to turn their faces away from the sun, so that the wild birds should not be able to gather the seeds. Now, these same sunflowers are down where the



Luther Burbank and Paderewski, the Pianist, His Friend; and, Above, the Noted Naturalist and His Dog. A Model of Proposed Memorial Statue Is Shown at the Left

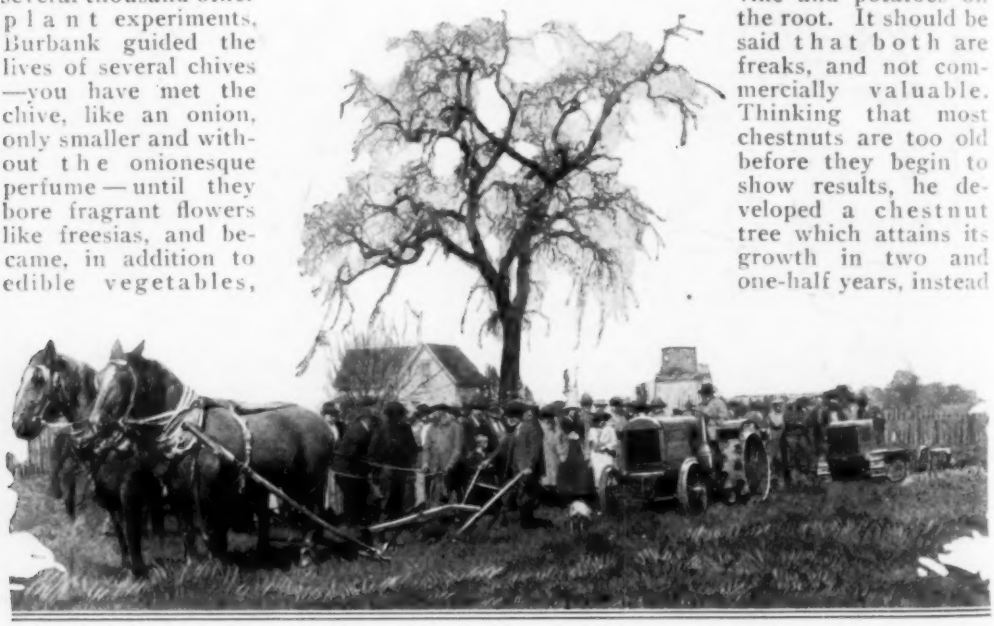
chickens can harvest them; they produce blossoms nearly two feet in diameter, and each seed is three times as large and contains twice as much oil as did the seeds of those first sunflowers which Mr. Burbank took as pupils in his California School for Plants.

A man, who is still living near Santa Rosa, some forty years ago wanted 25,000 prune trees, in time for the next year's setting-out. Burbank took 30,000 almond seeds, planted them under wet burlap, grew almond trees more than a foot high, budded them to prunes, and delivered the tremendous order, when everyone else said the job could not be done. Those trees are growing and bearing today. A firm of American vegetable packers sought a small, sweet-flavored field pea, like the French petit pois, which would ripen uniformly over a large acreage. Burbank took a gallon of seeds of the large American field pea, and six years' time brought forth a small pea, of which more than 6,000,000 cans were packed and sold last year.

When black walnut began to disappear as a commercial wood, the plant philanthropist developed a black walnut which grows, in ten to twenty years, to the same height and diameter as the wild black walnut does in forty to fifty years. The wood is as dark in color and as fine and close in grain as its wild prototype. Just for fun, among several thousand other plant experiments, Burbank guided the lives of several chives—you have met the chive, like an onion, only smaller and without the onionesque perfume—until they bore fragrant flowers like freesias, and became, in addition to edible vegetables, sweet-scented flowering plants for borders. He noticed that Nature, when she made the petunias, overlooked blue as a color, so he introduced blue to the petunia family, and, just to give it a prominent place, made the blue petunia four or five inches in diameter across the blossom.

Those who have been trained to eat artichokes usually consider themselves slighted if they get less than one of the buds to an order. Burbank has produced an artichoke, however, which is large enough for the ordinary family, since the blossom is 14 inches in diameter when the bud has opened. An ever-blooming sweet pea, a perennial poppy, a sweet-scented verbena, a primrose nearly five inches in diameter, and a brilliant-red California poppy, not to mention the well-known Shasta daisy, are among the results of his excursions into the flower garden.

With him into the realms of weeds and grasses and fruits and flowers, the noted naturalist has carried a sense of humor. Aside from taking the thorn off the blackberry, he put more pop in popcorn, so that now it puffs out to three times the size of the ordinary "popper," while there are more kernels to the ear than in the ordinary kind. He is undecided whether the joke was on the potato or the tomato when he crossed the two and presented the world with a plant which grows potatoes above ground, and another which grows tomatoes on the vine and potatoes on the root. It should be said that both are freaks, and not commercially valuable. Thinking that most chestnuts are too old before they begin to show results, he developed a chestnut tree which attains its growth in two and one-half years, instead



Noted Naturalist Heading Ground-Breaking Procession at the Commencement of Work on the Burbank Memorial Park in California, Where a Collection of His Creations Are Kept

Quick-Growing Mulberry Tree Developed by Burbank to Aid Silk Producers, and, Above at Left, the Original Spined Cactus Contrasted with the "Spineless" Variety at Right

of the ten or fifteen years required by the common chestnut.

It is doubtful if Burbank has realized $100 on the average for each of these developments. In 1922 there were shipped out of one western state alone 182,400,000 pounds of cereals, vegetables, fruits and nuts he has developed from more primitive and less productive forms. It is reasonable to estimate, though no figures are available, that the entire world produced ten times this amount of foodstuffs for whose development the "weed wizard" has been responsible.

At the end of half a century of plant development, he has just sold two of his experimental farms near Santa Rosa, to obtain money with which to carry on further experiments. The reason for this is not far to seek. Take, for example, a pearl white wheat, the earliest of all grains and the best resistant to diseases. The sales of this wheat for seed, by Burbank himself, were limited to a few hundred dollars, but it is estimated that more than $200,000 worth of it has been sold for seed by farmers and others who grew it from the original few pounds furnished by its producer. Once a pound of seed passes from his hands, he cannot control the seed of the plants this pound produces, and so has been unable to "cash in" on his productions.

In all his work, Burbank has tended toward the one idea often expressed in his addresses and his books: "The world is ours to mold by helping the hand of nature." This ideal is embodied in a statue which is to be erected to him in the midst of Burbank Memorial Park, at Santa Rosa —yet difficulty is being experienced in raising $25,000 necessary to complete it.

One of the most interesting features in the life and in the present work of this almost-unrewarded assistant to nature, is his constant optimism. Today he is in the midst of more than 2,500 experiments looking to the greater production of a better quality of foodstuffs and materials for the clothing of mankind. Simply enough he says, as he turns to the economic problem of production and consumption:

"It is not necessary to produce more food, but to produce more food per acre, so that fewer men, with improved machinery working on our farms, may feed more people who are devoting their attention to distribution and to manufacture."

¶Names and addresses of manufacturers of articles described in this magazine will be furnished free by our Bureau of Information.

WORLD IN MAGAZINE DELIGHTS YOUTHFUL FILM STAR

When Jackie Coogan is not hard at work under the studio lights, he enjoys a few moments to himself reading about the

Jackie Coogan Was too Deeply Interested to Smile when this Picture Was Taken

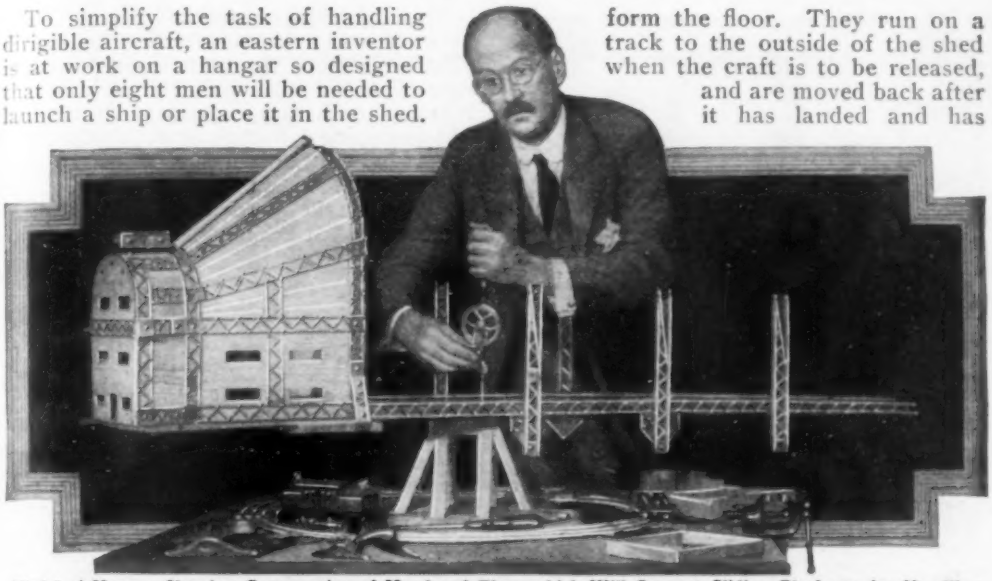
latest happenings in the world of inventions and discoveries, and he likes to look at pictures that weren't "acted out." The grown-up world has a fascination for Jackie and he finds relief from work in the studio in the pages of his favorite magazine.

PAPER THAT DEFIES FLAME CHARS BUT WON'T BURN

Treated with a chemical that makes it fireproof, paper suitable for printing purposes is being manufactured by an eastern company. Although it chars and becomes black when subjected to continued heat, it will not burst into flame. Printed or written matter it may contain is fairly legible after the paper has been held in fire. The fireproofing process does not prevent the absorption of ink. The danger of spontaneous combustion or blazes caused by carelessly tossed matches and cigarette stubs, is materially lessened by the new method. Valuable records and documents prepared on the stock run little risk of complete loss in case of fire. Inside pages of magazines bound in fireproof covers of the material can be insulated from contact with flames. The process is also adapted to making fireproof curtains, rugs, carpets, and in the protection of paintings and valuable fabrics.

SLIDING FLOOR AIDS IN HANDLING AIRSHIPS

To simplify the task of handling dirigible aircraft, an eastern inventor is at work on a hangar so designed that only eight men will be needed to launch a ship or place it in the shed.



Model of Hangar Showing Construction of Hood and Floor which Will Support Sliding Platforms for Handling Dirigible Airships: One Section of the Roof Is Shown Completed

Hundreds of helpers are sometimes necessary for this task with the ordinary type of such buildings. Sliding platforms over 700 feet long, to which the craft is anchored, form the floor. They run on a track to the outside of the shed when the craft is to be released, and are moved back after it has landed and has been fastened to its moorings. The walls and roof are 150 feet high and are supported by braced steel girders. The cost of the hangar is moderate.

GOLD PANNING OF EARLY DAYS AGAIN POPULAR IN WEST

Revived from the early boom days, when thousands of pioneers were borne westward on the backwash of a rumor of fabulous riches to be had for the mere taking, gold panning again is becoming one of that section's industries. Even streams which were worked many years ago are being made to yield a second harvest of the precious metal. Most of it is found, not in the present courses, but in the dry, abandoned channels. The panner throws out the "muck" from the old watercourse until he reaches what at one time was bed rock. This is carefully washed and brushed and placed in the pan with the material just overlying it. From the brook, the utensil is filled with water and the mixture agitated with a stick, some of the top poured off, and the process repeated again and again until nothing remains but the gold, which sinks to the bottom because of its weight. Discovery of paying "dust" after panning is often followed by placer operations or dredging where practicable.

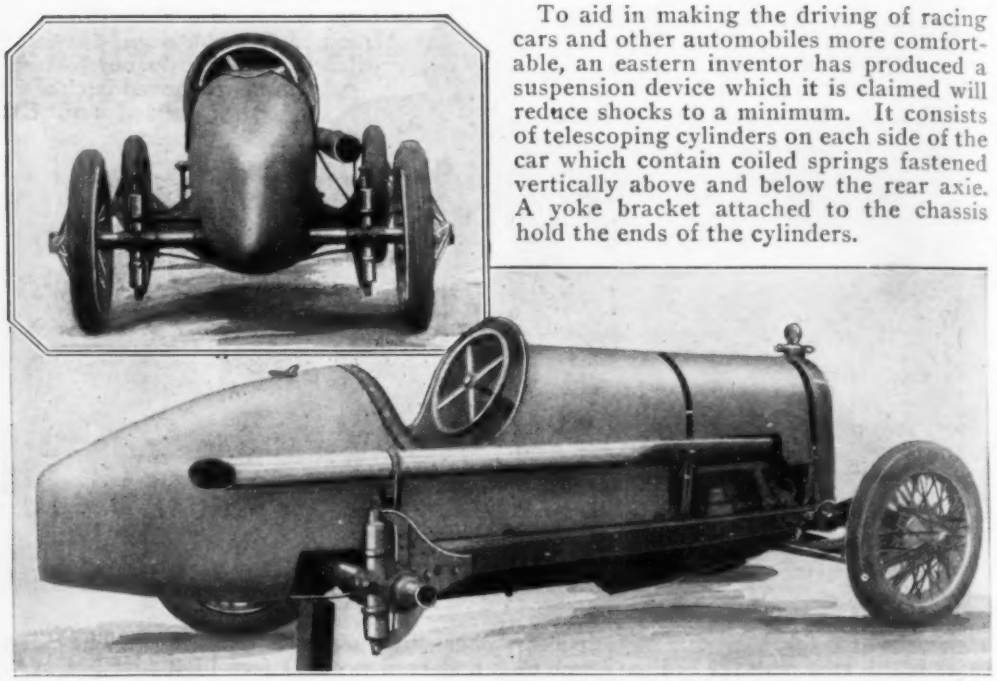
JARS KEPT DRY BY COVER PADS THAT ABSORB THE MOISTURE

Provided with a mineral-salt pad which absorbs moisture, a jar cover has been invented for keeping crackers, candies, and other foods from spoiling in humid or wet weather. The pad is held in a perforated metal container fitted to the inside of the lid. It is said to dry out the air which enters when the cover is taken off and removes dampness from sticky candies and other articles placed in the jar. At intervals of a few months the pad can be dried by baking.

¶Amid a desert of white snow, the Hospice of St. Bernard in Switzerland, celebrated its thousandth anniversary some time ago.

SPRING CYLINDERS ON AUTO REDUCE BUMPS

To aid in making the driving of racing cars and other automobiles more comfortable, an eastern inventor has produced a suspension device which it is claimed will reduce shocks to a minimum. It consists of telescoping cylinders on each side of the car which contain coiled springs fastened vertically above and below the rear axle. A yoke bracket attached to the chassis hold the ends of the cylinders.



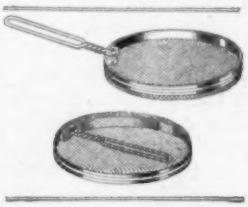
How the Telescoping Spring Cylinders on the Rear Axle Are Attached to the Racing-Car Chassis on a Yoke Bracket to Reduce Shocks While Speeding

SPARKLE OF FINEST CUT GLASS DUE TO WORKER'S SKILL

Craftsmen with skill almost equal to that of diamond cutters are required to give cut glass the sparkle of sharp edges, the intricate designs and the brilliant finish that distinguish pieces of superior quality. This fine workmanship is the result almost entirely of the worker's accurate eye and deft hand, only the simplest machinery, in general, the same kind of tools that were used generations ago, aiding him in his task. In cutting the finer pieces, the plain blank, or unfigured dish, is held by hand against a revolving iron disk. As the wheel turns, grains of carborundum, mixed with water, flow upon the glass, cutting out the pattern as the worker guides the piece by a few lines lightly sketched on the surface. The cuts are next smoothed with abrasive materials and then the high polish is obtained against a rapidly revolving wheel of poplar wood with the aid of rouge and a fine powder. In general, there are two grades of cut glassware, the inferior being cut from blanks on which the design has already been stamped or pressed by machinery. Sharp edges, smooth inside surfaces, and a ringing tone when the dish is snapped with the finger, distinguish the better pieces.

FALSE BOTTOM HELPS TO COOK FOOD WITHOUT SCORCHING

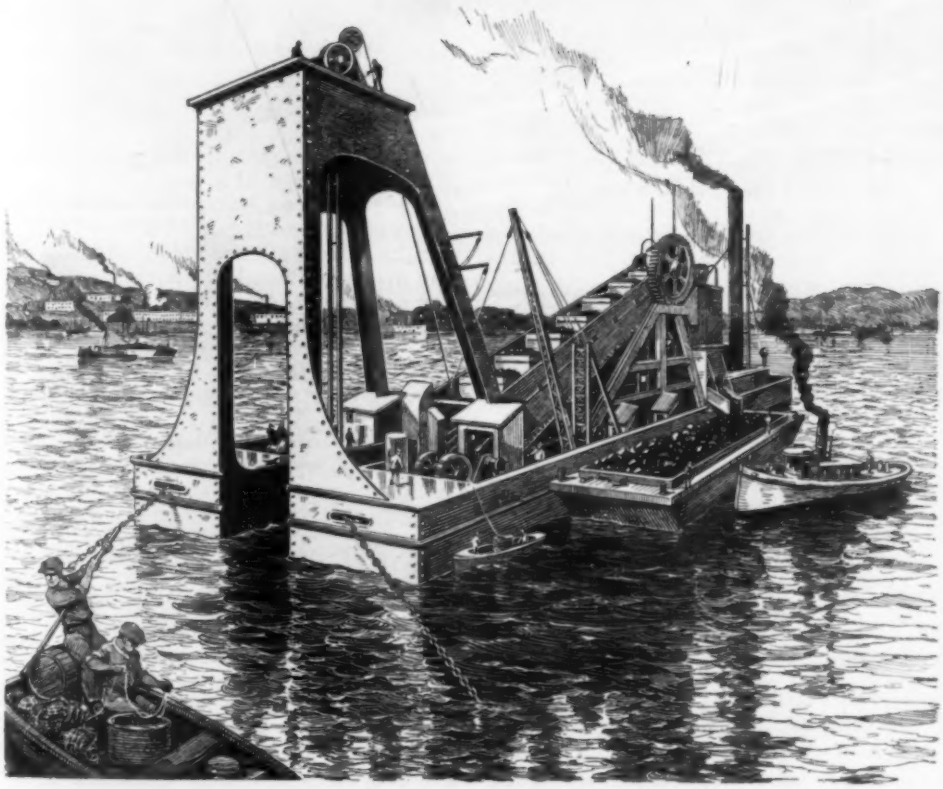
Lessening the liability to scorch vegetables, and doing away with the trouble of scraping burned food from the utensil in which it was cooked, a kettle bottom, made from wire mesh and set into a metal hoop, is now on the market. The device is of a size and depth suitable for the purpose for which it was intended. It is equipped with a handle which facilitates its use as an egg boiler, a toaster, berry washer, and the like. When used as a kettle base the handle is turned down.



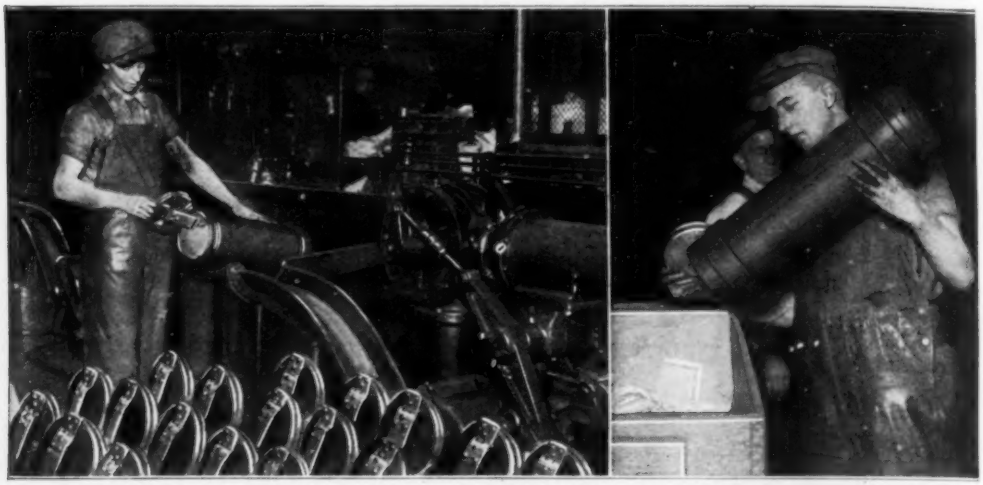
¶ One-third of the silk used in the United States is said to be artificial.

Mining a River Bed

While clearing the channel of a river in England recently, a dredge uncovered a rich vein of coal just beneath the surface of the stream's bed. Preparations were immediately made to mine the deposit and a floating digger with an endless chain of buckets was anchored over the spot to raise the black mass and load it into barges. Owing to its contact with the water, the coal is soft enough to permit the blades of the conveyor easily to scoop it up. As it passes swiftly upward most of the dirt and fine particles are washed out, leaving a clean grade of fuel.



FIVE MILLION LETTERS DAILY SENT VIA TUBE

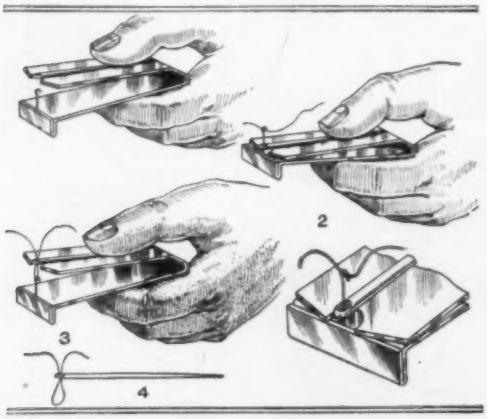


Left: Leather Carrier Loaded with Bundles of Letters and Ready for the Chute. Right: Emptying Packages from a "Car" which Has Just Arrived through the Tube

Winding about beneath New York streets is an intricate subway system of pneumatic tubes connecting the main post-office with substations for the delivery of first-class mail. The "cars" are leather carriers into which packages of letters are placed for distribution to the various stations. Silently and swiftly and on carefully timed schedules, these boxes shoot along under high pneumatic pressure through the twenty-six miles of the system. They are tightly sealed with lock tops when filled, and are oiled to permit easy passage through the tubes. Approximately 5,000,000 letters are handled daily on this busy line below the pavements.

WIRE HOOK TO THREAD NEEDLE SAVES TIME, AIDS EYES

To save time in threading a needle, a device has been patented in Europe recently that performs the operation quickly, even in poor light. A slight pressure of the fingers pushes a hooked wire through the eye of a needle that has first been placed on top of a small spring. Then the strand is put on the hook, which can be done by an unsteady hand, and as the grip is released the wire passes out of the needle eye, carrying the thread with it through the hole.



Needle Threader that Saves Time and Does Not Require a Steady Hand or Good Light

HULK SUNK IN SACRED LAKE FREIGHTED WITH RICHES

Roman bronzes of beautiful workmanship have been recovered from a vessel lying submerged in the waters of Lake Nemi, in Italy, long known as the "Mirror of Diana." The bronzes were mooring rings, six in number, representing the heads of lions, wolves, and tigers, a beautiful Medusa, and other designs. A piece of lead pipe, bearing the legend "Tiberio," was also found, leading to the belief that the hulk was of the age of Tiberius or Caligula.

¶Shoes of aluminum with wooden soles are now being used by workmen in German chemical factories.

PAPER COVER ON TOOTHBRUSH KEEPS BRISTLES CLEAN

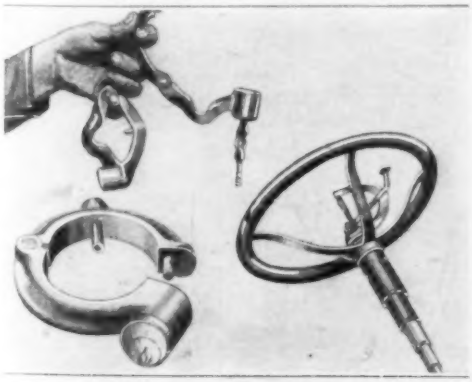
Guarding toothbrushes from infection is the purpose of specially made, heavy waterproof paper covers lately introduced to the trade. They fit snugly over the bristles, keeping them clean. Used either at home or while traveling, the guards are said to last for several months. They are also employed for advertising purposes.

LONDON FOGS SWELL COST OF LAUNDRY WORK

Damage done to various fabrics and the special laundering occasioned by a single London fog, according to a recent estimate, cost the residents of that city as much as $5,000,000. Quantities of soot are deposited as the moist cloud hangs over the streets sometimes causing almost complete darkness at noonday. Lower temperatures are usually recorded in the mist-surrounded areas, a difference of fifteen degrees being noticed recently between London and an adjacent city where the sun was shining.

"HANDCUFF" AUTO LOCK HOLDS WHEELS IN LINE

Fastened to the steering wheel of an automobile, a recently invented lock holds the wheels so they cannot be turned. This prevents towing or driving, but permits of the car being moved a short distance in an emergency or to comply with police regulations. Boring a small hole in the steering column is all that is necessary in order to attach the device. The lock is removed while the car is in operation, thus avoiding any danger of accidental locking.



Auto Lock and Screws that Hold It Like a Handcuff to Steering Column

AUTOMATIC SIGN FOR TRAFFIC PROVES ITSELF IN TESTS

Designed to speed up traffic and safeguard pedestrians, automatic traffic-control devices that look like the targets on railroad switches have been installed at street crossings in several cities. In addition to the arm, the machine is equipped with "change," "stop," and "go" lights, in amber, red, and green. Operation is through a series of gears driven by an electric motor. They can be set to close and open for any desired length of time. Recent tests in Chicago showed that they were better obeyed by motorists than were traffic officers. This was attributed to the fact that they are visible at greater distances.

Automatic Traffic-Guide Signals which Motorists Can See in Time to Obey Them

GAS IS SUPPLIED LAKE BARGE THROUGH FLEXIBLE PIPE

For convenience in supplying gas to a yacht club located on a barge in Lake Michigan, a flexible hose was used. This allowed for any movement of the hull through action of the wind and waves. Ordinary 4-inch pipe was laid along the pier leading to the clubhouse, the final connection being made through the tubing.

Class of Army Men Receiving Instruction in Sand Molding from Engineer Officers Who Train Their Charges in the Use of Fortified Structures as Aids to Military Tactics

Sand Molding Taught as Aid to Soldiery

AS an aid to the study of army tactics, engineer officers connected with the Armenian Legion on duty in northern Africa, are teaching the men how to build toylike, fortified walls, emplacements, and buttresses with wet sand. Miniature structures that rival in beauty those seen in the neighborhood of the barracks are cleverly worked up by the students under direction of the teachers, who then use the figures to train the soldiers in methods of attack and defense.

Many of the men have become highly experienced in molding such forms and make copies of the stonework and statuary that grace the old temples and churches seen throughout the territory. While some confine their efforts to small objects, others build gigantic forms of the same size as the originals. As a result, the area surrounding their quarters is filled with quaint sculpture work. Figures of sphinxes may be seen sprawling at the feet of some Egyptian monarch "carved" from wet sand and copied from an original that probably was cut from stone in dim ages of a past greatness.

Living Models Are Sometimes Posed as Subjects for the Sand Artists to Copy

Oriental citadels with spires and domes express the trend of the artists for architectural beauty. Or, perhaps, the subject will be one side of a narrow street of a village, the overhanging balconies of the tiny houses hugging the walls in faithful imitation of the real. Occasionally, several of the men take live models for their subjects, such as a horse and rider, and soldiers in various poses.

When the classes in military tactics are in session, however, only those things that have a bearing on the training of the soldiers are dealt with. Areas are laid out and walled towns are set up in sand miniatures. After these have been completed, the instruction in problems of warfare is carried out. Most of the practice work has to do directly with the territory in which the army is at the time occupied. Plans of action are first laid out on paper and from this, the zone of action is set.

Statuary Sculptured by the Ancient Art of Old Egypt Found Scattered Among the Desert Ruins Is Truthfully Imitated by Soldier Craftsmen Who Work with Wet Sand

PAINTINGS HUNG FROM TREES WHEN SALON BARS ARTIST

Failing to gain a place in the Paris salon, an artist recently entered his pictures in the "Fair of Crusts," a sort of "no-jury"

Art Gallery on a Boulevard Tree by which a Painter Attracted Buyers for His Works

organization designed to further the interests of the less successful painters. The artist exhibited his paintings by hanging them from the branches of a tree on the boulevard down which the crowds walked to attend the "gallery" exhibition, seeking in this way to get a market for his work, and recognition from the public.

"SOAP HOLES" OF COWBOY DAYS BECOME VALUABLE CLAY

"Soap holes," once thought by cattle rangers of the West to be dangerous mires of worthless slime, have become mines of mineral clay of great commercial value. Bentonite, as the substance taken from the deposits is called, has been made into an ingredient to give body and weight to paper and to aid in the mixing of wall plaster and pastes. Soap makers experimenting with it are said to have found it possessed of good cleaning qualities and beneficial to the skin. Many of the clays and massage creams used by beauty parlors are mixed with it as a base. In the raw state it lies near the surface and is similar to brittle shale rock. Since it absorbs almost seven times its volume of water, it forms a soft, slippery mass where the deposits are in low ground.

RADIO UNDER HAT LINKS MAIL FLIER WITH THE EARTH

Aerial mail pilots in transcontinental flights will soon be accessible from ground stations, according to postal experts, who have been working out a one-man sending and receiving radio set for use in the service. The receiver will be carried under the pilot's helmet and the transmitter on his breast. This will make it unnecessary for an operator to accompany the airplane. The whole mechanism, including batteries, weighs 170 pounds.

LAND OR WATER WAR "TANKS" ARE TESTED BY ARMY

Designed to cross lakes and rivers as well as to maneuver over rough ground, armored tractors equipped with propellers in addition to powerful belt treads have been tested by army officials. One weighing about 800 pounds, carries a driver and one passenger, and is capable of a speed of from two to sixteen miles an hour on smooth roads. It is self-propelling in water. A larger type can go from three to twenty miles an hour over level ground.

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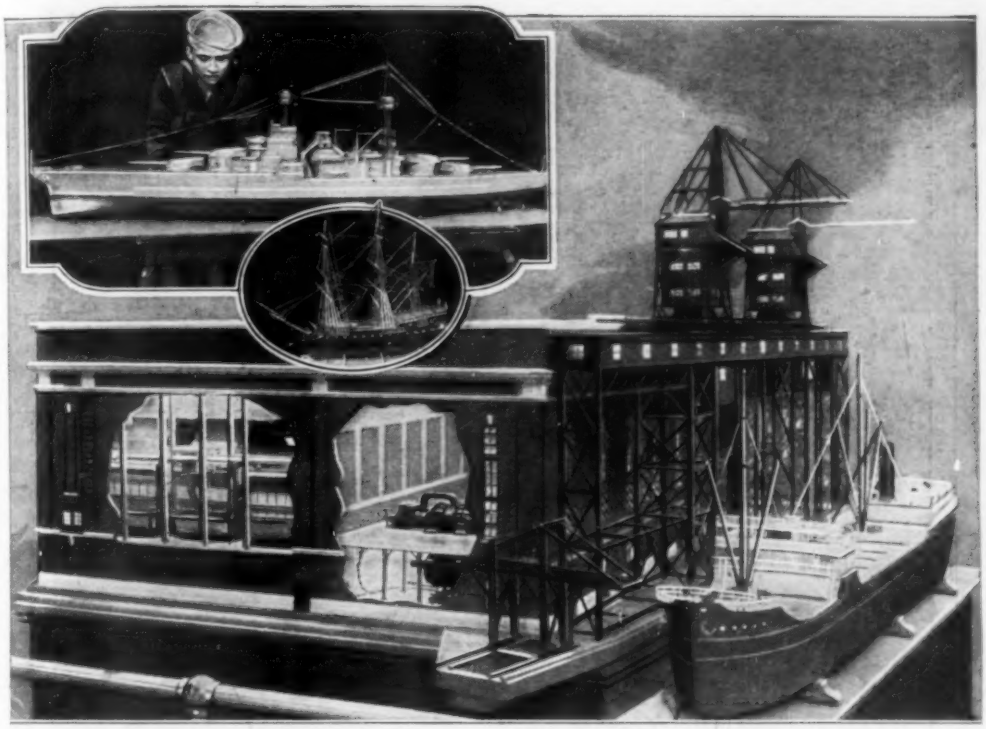
Army Land and Water Tractor Entering Stream After Having Traveled Over Dirt Roads

Both models are steered by folding rudders while in the water, and the bodies are built wide and flat so that they will not easily capsize.

PEACE AND WAR-TIME ENGINES SHOW PROGRESS



Above: How Electrically Driven Dreadnaught Appears beside Old Sailing Vessel Pictured in Inset. Below: Model of Huge Electric Power Plant and Loading Cranes

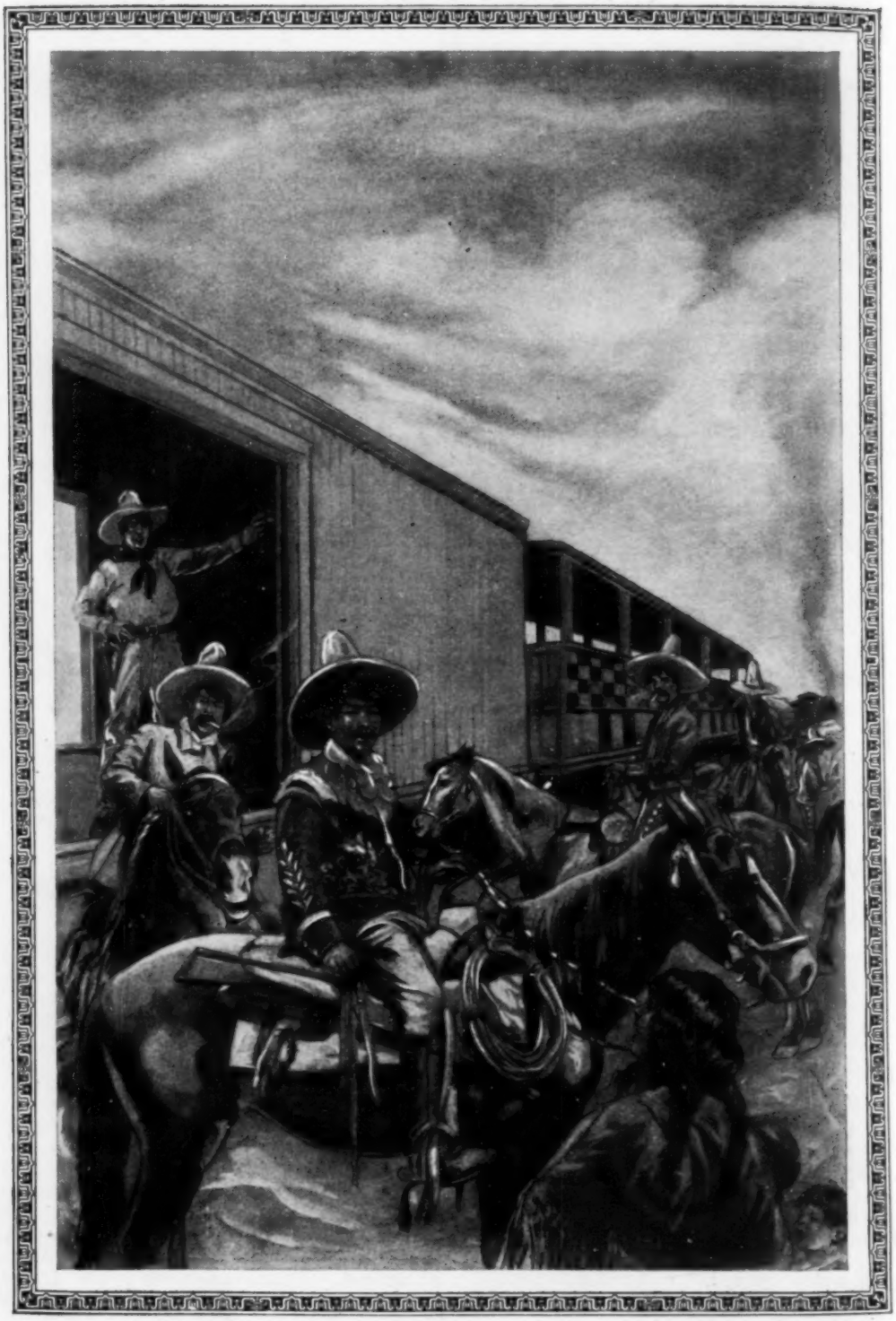
Showing progress of electrical research, two giant engines, one for peaceful purposes and the other for war, have recently been completed. They are an enormous power plant in the West, having a capacity of 300,000 kilowatts, and the motors of a monster electrically driven dreadnaught of the U. S. Navy.

TRIPOD FOLDS INTO CANE WHEN NOT IN USE

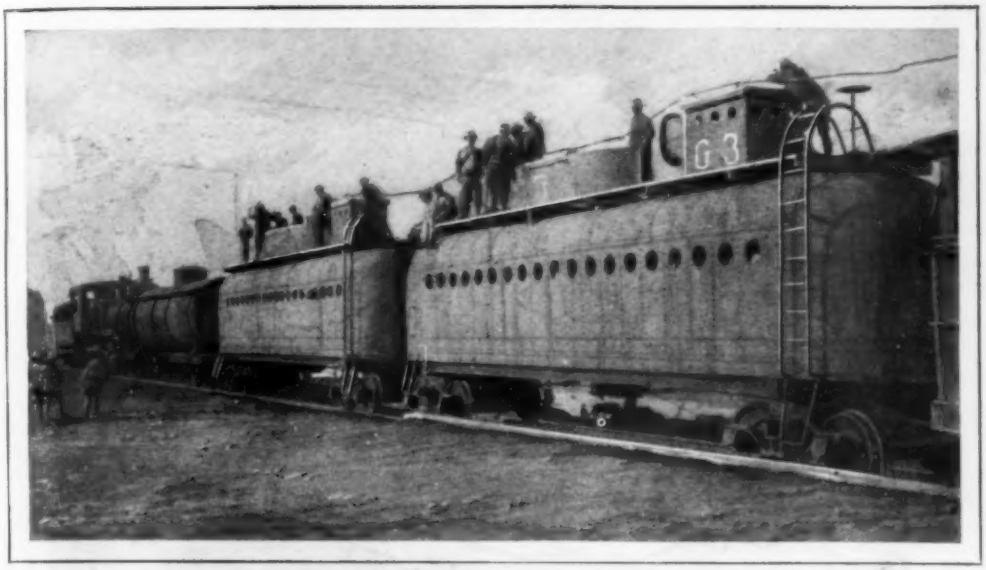
Among recent English inventions is a tripod for cameras which closes up so compactly that it may be used as a cane. It weighs only fifteen ounces, and opens automatically when the knob which forms the top is unscrewed. The legs require no adjusting when opened, and form a rigid support. When the camera is removed, they close quickly.

SHIP IS SENT BY PARCEL POST FOR USE IN AFRICA

Shipbuilding has been reduced to a science so precise that it is now possible to construct vessels in such a manner that they may be taken to pieces, the parts shipped, and finally reassembled into a seaworthy craft at the destination. Each part is numbered and ticketed, and full instructions accompany it, a vital necessity, as the engineer is often compelled to make use of native labor, which always must be under his eye if he is to secure satisfactory results. The steamship "William MacKinnon," the first to be launched on Lake Nyanza, Central Africa, reached Mombasa by parcel post from England. Then the parts were transported through 500 miles of jungle to the lake, on the heads of 5,000 Kaffir porters. The boilers were dragged by oxen.



Checkerboard Armor on Gondola Car, Roofed Over to Protect Soldiers Guarding Passenger Trains During Mexican Revolutions, and Troopers Starting on Bandit Hunt



Two Modern Armored Cars Used in Pursuing Pancho Villa

THE TOOLS OF MEXICAN REVOLT

Crude Armored Cars Aid Ragged Troops in Treks Across Plains in Five-Week Campaign Against Villa's Outlaws

By SIDNEY McNEILL SUTHERLAND

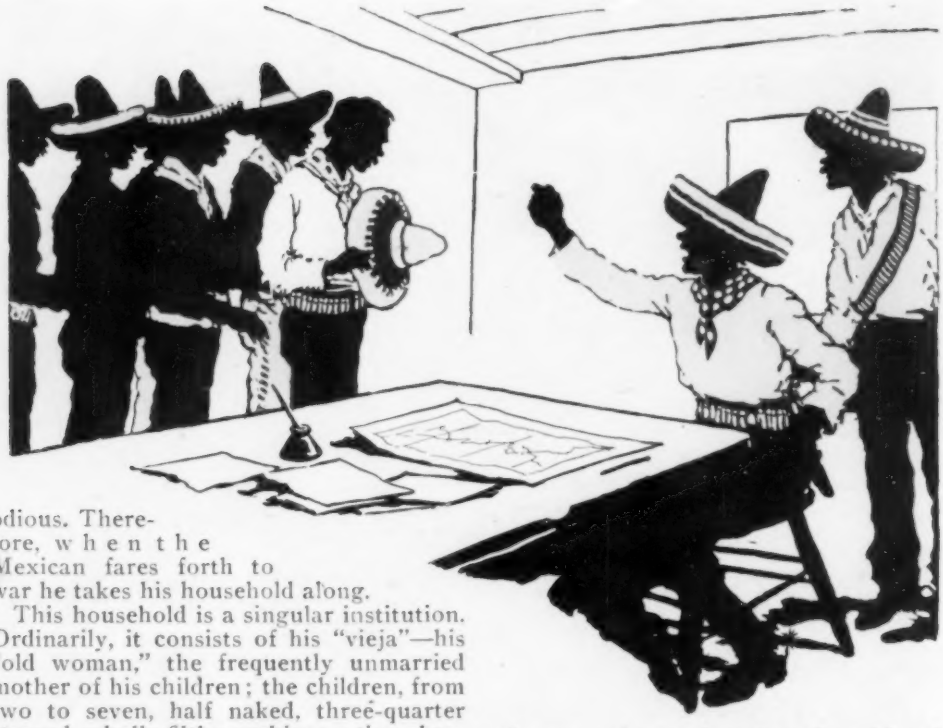
WHEN Mexicans fare forth to war their accoutrements are usually as astonishing as their methods are primitive and ineffective. The numberless revolutions that have desolated that unhappy country have finally worn out and destroyed the really splendid equipment that Porfirio Diaz had provided for his forces; and the war secretaries and quartermasters and "generales" and "armies" that succeeded him in endless array have been forced to exercise the most amazing ingenuity to replace with homemade weapons the fine military implements the great president left.

Experiences, when duplicated, can be summarized. The five-weeks' campaign on which I accompanied Gen. Joaquin Amaro in his pursuit of the late Francisco Villa across the state of Chihuahua in June and July of 1920, was typical of many expeditions in which it was my fortune to participate during the ten years of revolution that spanned the interim between Diaz and Alvaro Obregon.

Following the assassination of President Venustiano Carranza on May 21, 1920, the Chicago newspaper which had sent me to Mexico, instructed me to join the 29-year-old general in the northern part of the republic. I reached Jimenez, then Amaro's headquarters, on June 10, presented my credentials, and was invited to make his private car my home as long as I cared to stay. Later, we gave up the little Pullman for a box car, in which we placed cots, tables, chairs, filing cabinets, and a charcoal stove for the barefooted and exceedingly dirty chef to use in the concocting of mysterious, fiercely spiced, and crudely served dishes.

The private car was on a siding. On half a dozen other tracks in the yards of this junction of the Mexican Central and the Parral railroads, were seven long freight trains. These contained Amaro's forces, about thirty-five hundred nondescript soldiers, their women and children, cavalry horses, dilapidated artillery, ammunition, hay, and water tanks, the latter a significant item in a campaign about the deserts of Coahuila and Chihuahua.

A Mexican army is like none other in all the world. For one thing, it has no commissary! A private gets fifty centavos a day (25 cents American money), and with this he must supply himself with food and clothing. The combination of his routine duties, sudden summons to battle, long treks across the plains, his inherent sloth and his amorous nature make the functions of quartermaster and cooking



odious. Therefore, when the Mexican fares forth to war he takes his household along.

This household is a singular institution. Ordinarily, it consists of his "vieja"—his "old woman," the frequently unmarried mother of his children; the children, from two to seven, half naked, three-quarter starved, wholly filthy urchins; a tiny charcoal cooking apparatus; a bundle of the rags they call clothes; a crate containing a pig, a goat, three or four chickens, a parrot or two, a mocking bird, and a tame rabbit. Another article in this series will chronicle this amusing phase of Mexican militarism.

Thirty-five hundred lazy, ragged, indifferent, poorly armed, hungry patriots thus accompanied comprise an extraordinary caravan of military impotence, picturesque chaos, and hopeless confusion.

For five weeks we chased the homicidal and elusive arch-bandit in vain. Amaro's tactics, based on the reports of scouts and spies as to Villa's movements, were approximately as now set forth.

A courier dashes in, for example, at daybreak of June 27, with a story that Pancho had been seen in the western foothills of the mountain range about Presidio, on the Rio Grande. Instantly, the camp is astir. Amaro claps his hands and excited members of his staff respond. With crisp and highly profane sentences he gives his commands, and orderlies dash away to summon the "generales" and their staffs.

In a few moments the bepistoled rascals were running hither from the huts and trees in whose shade they had been snatching a "siesta." Soon the private car is cluttered with officers bending above the maps Amaro has spread on his table.

"How is the blacksmith doing with your battalion?" he asks Arnulfo Gomez.

"Senor, I think he is—"

"You think! Why the devil don't you know?" the commander in chief roars. Gomez scratches his head.

"Well, general," he stammers. "He has shod sixty horses, and there remain forty to be—"

"There remain forty!" The youthful chieftain pounds the table. "He and his assistants have had three days to finish your hundred animals. If you had not been swilling tequila with him two nights ago at Esteban Morales' gambling house he'd be through now. You fool, I ought to have you executed!"

Gomez, like the others, wonders again, as he has often wondered before, how his brilliant young jefe learns his secrets.

"Never mind," Amaro continues. "You put your sixty peones in the saddle in half an hour. Get 100 rounds of ammunition and five pesos from the paymaster for each man, and leave within an hour for the Loma Azul ranch. You will arrive at sundown. Post sentries, pass the night there, and at 3 in the morning be on your way toward the Valverde Peak. When you arrive there day after tomorrow at noon, comb an area thirty kilometers square, and then proceed to the Rancho

Gutierrez. I will have orders for your next move awaiting you there.

"Here is a list of thirty men and two women. You will find them in the ranches and towns along your route. Catch them and hang them to the nearest tree—they are Villista aids or sympathizers. And tell those sixty men of yours to leave their families here; they will be allowed ten centavos a day and charcoal.

"Now get out of here, and if you deviate one inch from these orders, I'll have you shot the next time I see you. No; I'll shoot you myself."

"General" Gomez—and those present—know this is no idle threat; and, presently, Amaro's orders to the others (orders which, if correctly obeyed, should encircle Villa in the center of the converging cavalry columns) are interrupted by the oaths of men saddling restive horses, by the coyotelike wails of deserted "viejas," and the shrieks of brown-bellied babies.

"Tell those women I'll run every one of them out of camp if they don't stop that infernal screaming," Amaro cries to an orderly; and soon the lamentations cease; and extended clouds of dust in every direction tell of horsemen off on the routes Amaro has traced on his map to trap the wily outlaw and his men.

After the troops had departed and the women had been consoled by each other and by the remaining officers, Amaro gave orders to prepare a military train for a trip up the line to Santa Rosalia de Camargo, a lovely little town on the great Concho River. By moving his headquarters there, the general would be directly west of, and at the town nearest, the point where Villa was reported to be hiding.

Tiny Sopwith Airplane Being Assembled at Jimenez, Chihuahua, for Use in Search for Villa

General Espiridion Rodriguez Squatting Beside a Huge Dynamite Bomb That Failed to Explode Under Passenger Train Near Estacion Concho

In less than an hour the patched-up switch engine was making up the train. The private car was placed near the switch on a siding; two checkerboard armored gondolas were coupled to it; four flat cars with aged 3-inch guns and pup tents for the artillerymen, were added; fifteen box cars filled with horses and saddles and hay, and carrying forty privates on their roofs, were shunted in; the only two modern armored cars in the republic were brought up; a heaving, protesting, and oft and crudely repaired engine was attached, and the train was ready.

Carrying the general's own bodyguard, the two gondolas next to the Pullman were unique propositions. Sheets of half-inch boiler plate were nailed to the outside, separated by about six inches from the sides of the car. The iron was painted like a checkerboard, about fifteen of the black squares on each side having been chiseled out. A small wooden chute led from each of these loopholes to similar holes sawed in the gondola's sides, and the 6-inch space was filled with gravel and sand, making an effective 9-inch barrier to any rifle bullet. The members of the escort kneel, which brings their heads below the top of the armor, thrust the muzzles of their rifles through the 4-inch apertures, and fire at their foes beyond the right of way. The latter, a couple of hundred yards away, have trouble in deciding which of the checkerboard squares to shoot at.

We reached Santa Rosalia by sundown, went into a siding, and looked the town over. The next morning, while loafing and wondering what progress the cavalry

columns were making, we were stunned by a telegram from Estacion Concho, forty miles north, that Villa had dynamited the daily south-bound passenger train. As we made feverish preparations to entrain, Amaro cursing homerically the deceptive report that had sent a thousand of his men on a goose chase into the mountains, further details of the raid on the railroad were sent by the telegraph operator at Concho.

The passenger train, it seemed, was in a deep cut about a mile north of the Estacion, when a bomb was exploded with terrific force under the first armored gondola, immediately back of the engine tender. A second sooner and the infernal machine would have wrecked the engine, which was Villa's intention. The checkerboard car was twisted and torn and thrown off the tracks, the engine coupling was broken, and the engineer had put on all steam to Concho.

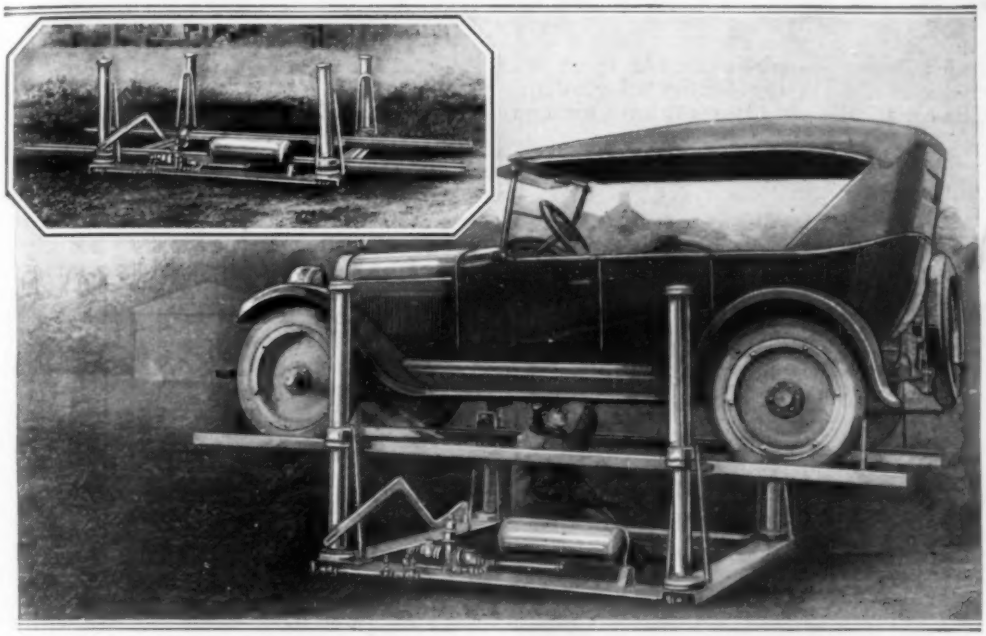
In a moment the bandits hiding in the brush had crawled up to the embankment and were pouring volleys into the passenger coaches and at the armored car on the rear of the train. The guard there put up a heroic resistance and really kept the Villistas from capturing the train. The latter, anathematizing the luck that had let the engine escape to give the alarm, finally retreated, carrying with them a dozen captives from the wrecked gondola. A couple of days later I saw the twelve hanging by their necks from trees along the road Villa took in his flight to the mountains. They were his "compliments" for Amaro's pursuers.

Amaro reached the scene by noon. He embraced and rewarded the sergeant who had conducted the defense of the train by making him a captain. Then, while soldiers filled up the great hole in the tracks and laid down ties and new rails, we examined the Villista's companion bomb which had failed to explode under the last gondola. It was a 5-gallon sheet-iron "can" filled with dynamite sticks, its covers kept on by a large bolt running through it. Two slender electric-light wires attached to the cap had been detached in some manner by the detonation forward. The wires ran from the bomb across the right of way, up the embankment, along the ground and out through the chaparral for a hundred yards to where a bandit operated a telegraph key and a small dry battery.

By sunset the five or six dead had been buried, small crosses being erected above their graves; the wounded soldiers and passengers had been given first-aid treatment; the pursuit was organized; couriers were sent to recall the misguided columns far to the south; the tracks were repaired, and the trains proceeded to Santa Rosalia, where another period of watchful waiting began.

Villa finally surrendered in August to Gen. Eugenio Martinez, in the state of Coahuila. There he might expect mercy; Amaro would have executed him.

HYDRAULIC HOIST FOR AUTOS REPLACES PIT

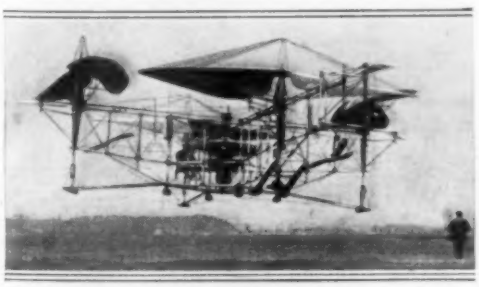


Hydraulic Hoist that Eliminates Pit in Repairing Automobiles and Lightens Mechanics' Labors. Below: Car Clamped to Runway and Raised

Reducing to one-half the labor required of mechanics working underneath an automobile, and doubling the working output, are said to be the advantages of a new hydraulic hoist on which patents are pending. Completely assembled, the device takes up little more floor space than a car. The automobile is driven upon a runway of channel iron, suspended from four piston plungers, and a few strokes on a pump handle lift the car evenly, three feet, giving the mechanic a working space of four feet. By means of a valve, either end can be lowered, raising the other.

AIRCRAFT SKIMS ABOVE EARTH AFTER RAISING ITSELF

Ignoring the upper levels of the air, an inventor recently testing a new type of air-



Helicopter which Made Flights at Altitudes of about 10 to 15 Feet from the Ground

plane in France, kept his machine within a short distance of the ground. The model, which was of the helicopter class, maintained its weight at a height of only 10 to 15 feet, flying a considerable distance before landing. This method is said to be favorable to the horizontal propeller with which such craft is generally equipped, since it serves to "pack" the air between the whirling blades and the earth, giving a better support for the flight.

USE OF GAS TO TRAP ANIMALS IS SUGGESTED BY EDISON

At the suggestion of Thomas A. Edison, the inventor, army experts are seeking to devise some means for using poison gas in connection with trapping so that wild animals will be instantly killed instead of lingering for hours in torture. The use of electricity in the traps was declared to be commercially impractical. Therefore, it was suggested that a chemical might be so placed as to be released when the trap was sprung.

ROSES CUT FROM SEA SHELLS RIVAL NATURE'S EFFORTS

Faithful to nature's own design and color, flowers are being made from sea shells that rival the beauty of gardens. The artistically cut blossoms have become

Flowers Created from Carved Sea Shells that Appear so Lifelike They Rival Nature

a popular fad in France. Delicate petals of roses are imitated so faithfully that to the unpracticed eye they appear to grow. Models of roses, tulips, hyacinths, and hydrangeas are said to be cut with such skill that even the glint of the radiant colors deceives the observer.

USE OF BROOMS IS INCREASING DESPITE VACUUM CLEANING

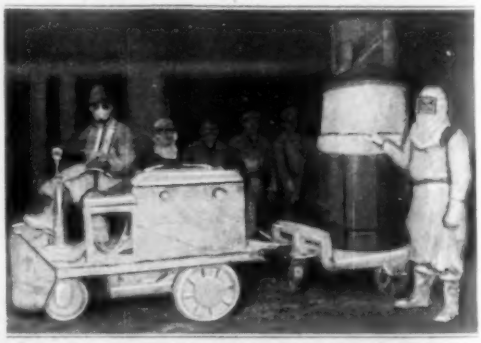
Although the advent of vacuum sweepers has revolutionized house-cleaning methods, brooms are in greater demand than ever before and improved devices for their manufacture are being produced constantly. Government reports showing that approximately 50,000,000 brooms are consumed each year in the United States, and the slightly increasing acreage devoted to broom-corn culture, indicate that modern inventions have not entirely displaced the time-honored household implement. "Fancy" brooms for cleaning fine carpets and rugs have almost disappeared from the markets, but the "plain" article is in heavy demand. Unpainted handles, fine-fibered corn, regular and even shoulders, and tight sewing, are points that distinguish a well-made broom, and defects in their construction are detected easily.

ACTIVE VOLCANO "FOR RENT" AS POWER PLANT

Capable of furnishing enough steam to develop electrical energy approximating 400,000,000 kilowatt hours a year, a partly extinct volcano in Bolivia is "for sale or rent," according to a report recently received by the United States government. The value of the jets of vapor that shoot up from the volcano's sides was realized by an expert following the discovery of the crater a few years ago. Lack of capital prevented development of the project, after the first few experiments. Internal heat from the earth has been utilized for some time in Italy to generate power.

MASKS AND DUSTPROOF ROBES GUARD CHEMICAL WORKERS

Workers in the dark bleaching chambers of an eastern chemical factory go about their toil in masks, hoods, and respirators to shield them from dangerous fumes and dust that arise from the materials they handle. Their clothing becomes white with fine blanching powders. In addition to the face guards, a covering



Masked Workers of a Chemical Factory Protected Against the Injurious Effects of Acid Fumes

which ties securely in the back and has a window for the eyes has been found effective. Another mask, called a "muzzle," is composed of flannel wound about the lower part of the head, covering the mouth. Leather mittens and hose made of wool are also worn to resist the effects of chlorinated lime.

¶Iron ore of excellent quality has been discovered in Cuba.

INDIANS BUILD HANGING BRIDGE WITHOUT NAILS

Ingenious bridges have been constructed by the more advanced American Indians without the use of nails or any other metal. The famous hanging bridges constructed by the Peruvians are often mentioned as marvels of primitive engineering. In the Sierra Nevada of Northern Columbia, the Arhuaco Indians, in the lower mountains, erect bridges that are held together entirely by vines and ropes made from fibrous plants. They first select a place where the stream to be spanned is narrow. A large number of long, thick poles with forks at the upper ends are stuck firmly in the ground near the water's edge and tied to the branches of trees. They are placed in several short rows parallel to the bank, those farthest inland being short and vertical, those close to the water, long and leaning out over the stream. Crossties are put over the uprights and lashed firmly with fiber cords. This done, the shore end of the structure is heavily weighted with stones, and the span is then thrown across and securely fastened. Thus safely erected, the guard rail is put in place, f r even the Indians would find it difficult to walk across the logs if they were burdened with heavy loads. Naturally, the bridges are not very strong, and never more than two people are permitted to venture on any of them at the same time. Domestic animals are made to wade or swim the stream when it is necessary for them to cross it.

Left, Bridge Erected by Indians that Is Held Together only by Lashings of Vines, and Right, View of Passageway. The Floor Is a Single Log with Guard Rails

ATOMS TOO SMALL TO BE SEEN ARE ANALYZED

Atoms 2,000 times too small to be seen under a microscope, and once thought to be the tiniest particles of matter, are described under a recently advanced theory as built like a solar system with electrons, or negative units, revolving about a positively charged center in much the same way as the planets revolve about the sun. Since the action of all matter is believed to be based upon electrons and protons, the positive form of electricity, the universe, under this theory, is regarded in somewhat the same light as a gigantic atom, the earth being one of the electrons.

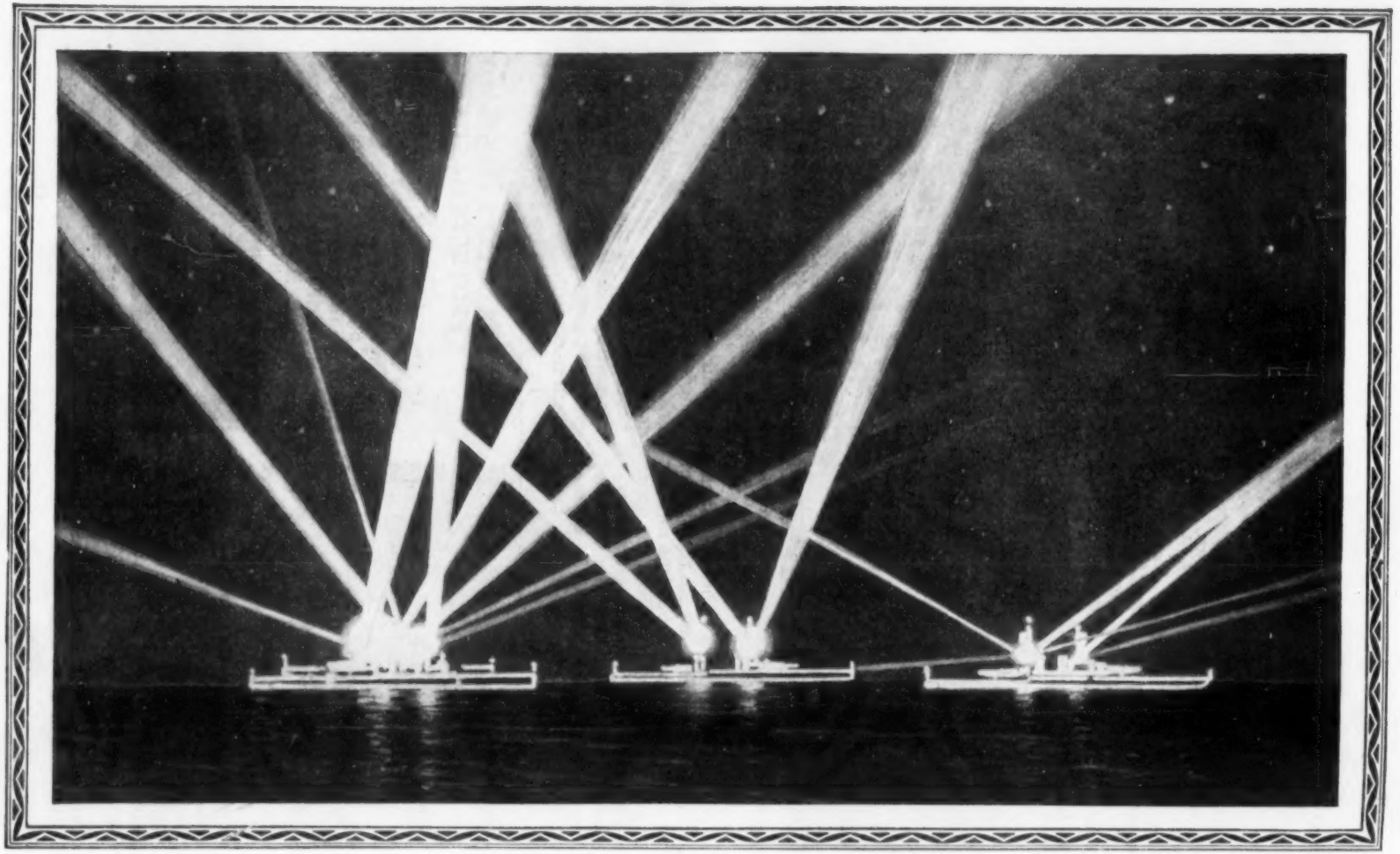
¶Collecting of balata gum, derived from the milky juice of the balata tree and used in making rubber belting, is one of the principal industries of British Guiana.

TWINE CUTTER LIKE HOOK PROTECTS HANDS

To protect workers' hands from injury while snipping cord, a twine cutter has been invented by a Pacific Coast man to take the place of the ordinary knife. The end of the tool is turned up like a buttonhook, the inside of the curve is slotted, and a small blade is inserted in the opening.

Cutter for Twine that Is Bent Like Buttonhook to Add to Efficiency of Worker

When the string is to be severed, a slight hooking motion with the utensil guides the strand against the sharp edge.



During an Electrical Display that Marked a Naval Pageant, Millions of Candlepower Radiated in Beams from Giant Searchlights that Illuminated the Sky for Miles Around with Ribbons of Opalescent Light

Monster Searchlights Are Eyes of Fleet

Naval Experts Develop Bigger Beacons to Meet the Needs of Faster Cruisers and Destroyers

WITH the building of warships like the U. S. cruiser "Concord," faster than any ocean liner and propelled by power enough to supply all the public utilities of a city like Baltimore, naval experts have directed their attention to designing more powerful searchlights for protection against submarine and torpedo-boat attack and to aid in signaling.

Visible at a distance of approximately 127 miles, the beam cast by the latest of these monster beacons is estimated at 500,000,000 candlepower. So concentrated are its rays that they will blister the skin and also cause sunburn. Known as the "eyes" of the navy, their work is largely defensive, as they are depended upon to reveal enemy craft during night attacks.

After a day spent in big-gun practice by the fleet in southern waters recently, the value of the searchlights was displayed dramatically during the progress of a war "game." Already stripped for action, the drab, gray, fighting monsters were swallowed up by sudden, tropical night that fell over them like a shroud. "General quarters" followed mess aboard the ships and, as the pole star wheeled into view overhead, every sailor and officer stood at his post, peering with anxious eyes into the darkness.

Away in the distance could be seen long fingers of light groping across the waves, beacons of hope from a protecting screen of destroyers and scout cruisers that surrounded the battleships and dreadnaughts as they rode quietly at their anchors. Somewhere in the encircling blackness, quivering under the suppressed power of their mighty engines, lurked a flotilla of "enemy" torpedo boats—assassins of the deep—waiting for an opportunity to drive home their attack.

After what seemed like hours of tense waiting, the beam of one of the searchlights near the horizon began to scrawl a code message across a distant cloud bank, rising and falling to indicate the dots and dashes. On the bridge of the flagship, a signal officer jotted down the words:

"Enemy—sighted—north—north—east—stop—am—starting—in—pursuit."

As the radio began to bring in reports on the progress of the chase, the searchlights of the fleet were brought into action to prevent any surprise attack while the ships of the protective unit were seeking to close in on the quarry.

Restlessly searching the waves, one of the beams momentarily touched a dark object and passed on. Almost instantly the phone connecting the bridge with the fighting top rang.

"Destroyer on port quarter," was the report.

At the same time the strange craft which was racing along at express-train speed, was picked up again by other shafts of flame, but before its range could be relayed from the fire control to the bridge and secondary batteries, it vanished by suddenly turning sharply on its course and disappearing under the smoke screen it had been laying.

"Stand by!" the telegraph dials signaled frantically to the engine-room crews, as the ships hurriedly slipped their anchors in preparation for instant flight. Then, "Slow speed ahead," followed by "Full speed."

As they picked up way, the ships were swallowed up by the clinging smoke screen. Foglike in its density, it blotted out the stars and stopped the beams of the searchlights, turning their rays into mere glowing balls of orange-red flame. In response to orders from the flagship, the useless searchlights flickered out, and the ships, in column formation, steamed on, each being guided by a hooded light in the stern of the one ahead.

From the wireless room came the word that their signals were being "jammed," presumably by interfering radio waves sent out by the "enemy," and at the same time the submarine telephone gave warning of the presence of other ships, although indistinctly, because of the noise of the fleet's own engines and propellers.

To try to stay under the cover of the smoke screen, or to take a chance in the open? That was the problem faced by the fleet. It was decided in favor of the former course, as, without the protection of the fast destroyers that had been lured away on a futile chase, the only salvation for the comparatively slow battleships was in sighting and destroying the "enemy"

torpedo boats before they could approach close enough to discharge their deadly missiles. And there was always the hope that the distant cruisers might return in time to be of assistance.

But the plan was defeated by a vagrant gust of wind that rolled away the smoke shroud as though it were a great carpet, revealing a flotilla of torpedo boats steaming along in a parallel line so close that the big guns of the fleet could not be lowered sufficiently to be brought to bear.

Scarcely a word was spoken on any of the ships. In the secondary batteries of three-inch guns, pointers and sight-setters brought their pieces to bear as they received the range from the fire control through the telephone sets strapped about their heads.

"Fire on buzzer," came the order from the bridge of the flagship to the port battery in preparation for a ranging shot.

"Four thousand—," began the voice from the fire control in rectifying the range.

But the sentence was never finished, for the flotilla turned at right angles on its course and dashed toward its prey while a triumphant rocket tore across the heavens from the deck of the leader, bursting like a trench light above the fleet.

All was over, for, according to the rules of the "game," the fleet had been sunk, as the "enemy" had been able to approach within 4,000 yards without detection. "Secure," sounded the bugles, and, with all lights on, the ships slowly returned to their anchorage.

In signaling, the rays of the searchlights are interrupted by shutters so as to form the dots and dashes of the code. Carbons used in the electric arc that supplies their powerful rays have a core of a chemical composition. When this is fused, it forms an intensely bright ball of flaming gas, but cuts down the heat so that the lens can be placed closer without melting.

The result is an almost perfect concentration of the rays capable of carrying great distances except in a fog.

SPEED OF GOLF BALL DEPENDS ON WINDING

From a Center of Soft, Live Rubber, the Golf Ball Passes Through Various Stages, Acquires a Hard Rubber Shell, and Is Finally Ready for the Tee

Once fashioned of feathers stuffed into a leather cover, golf balls now are delicately constructed spheres, made with exacting care on complicated machines under the eyes of experts. Resiliency, durability, and perfect shape are the essential requirements. About a live core, yards of rubber tape are wound in machines which turn out thousands of the "pills" a day. The speed of the ball depends on the winding, according to tests. The hard covering is manufactured of balata, a product of trees grown in Venezuela. This is mixed with gums of various kinds to give it toughness. The cover is tightly joined to the tape-wound center by a special process and, after indentations have been made in the surface to give the ball accuracy in flight, it is coated with a special kind of paint to resist blows of the clubs and to make it visible on the greens.

LIQUID SOAP IN BRUSH HANDLE MAKES SHAVING EASY

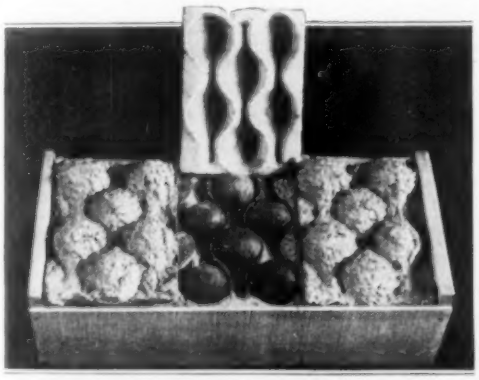
To make shaving more convenient, a brush which lathers with liquid soap, supplied from the hollow handle of aluminum, has been made. The bristles are mounted in a detachable holder of the same metal, and can be removed easily for cleaning. The liquid is shaken, drop by drop, onto the brush, and the valve, through which it passes, is then automatically closed.

CONCRETE FREIGHT CAR SAVES LOSS BY WRECK OR RUST

After undergoing severe tests in collisions, the impact of which could be heard for miles, a 15-ton reinforced-concrete freight car recently built in Germany showed neither crack nor break. The weight of the car is greater than that of a steel carrier, but it is said that the former runs steadier, is immune to rust, and is less affected by wear. Traveling at a speed of about 13 miles an hour, it crashed into stop blocks placed on one rail, and also into steel cars.

PAPIER-MACHE PACKAGE KEEPS FIGS FROM SPOILING

Packed in papier-mache containers, figs are now shipped by express without icing, from California to eastern markets. Only those 2½ inches in diameter are sent in this way, uniformity in size being necessary to fill a package that holds three dozen so that they do not touch or rub. The



These Papier-Mache Containers Protect Figs from Bruises and Keep Them Cool

fruit is nested securely in the carrier and is said to be uninjured and kept cool and dry in transit.

BIT OF WIRE TO HUNT QUAKES AND FORECAST TREMORS

To chart movements of the earth's crust so that scientists will be able to forecast quakes, a tiny seismograph, weighing less than a portable typewriter, and no larger, has been put in use by the Carnegie Institute. It is claimed that this little machine records tremors undetected by the heavy types now used. The main part of the instrument consists of a length of wire of the same weight as the filament in an electric-light bulb.

SMOKING MACHINE "BREAKS IN" AND TESTS NEW PIPES

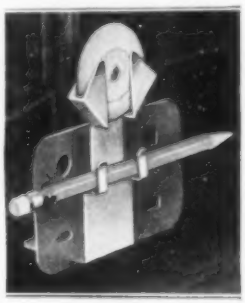
Patrons of a tobacco store in London avoid the unpleasant experience of "breaking in" new pipes by having them tested

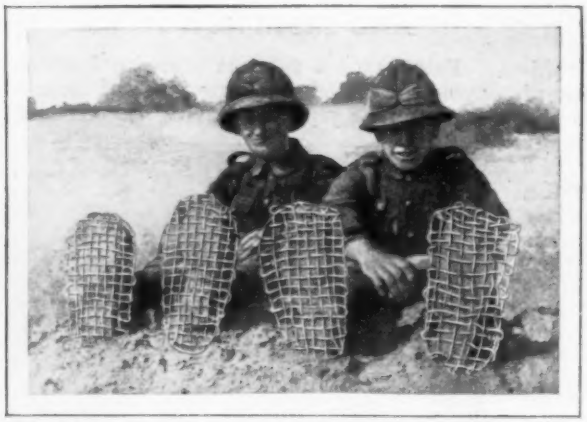
Copyright, Keystone View Co.
Automatic Smoker that "Breaks In" New Pipe While the Customer Waits

and seasoned in an automatic smoking machine which the proprietor has used for some time to demonstrate the qualities of his goods. The pipestem is inserted into a tube to which suction is supplied by a small air pump within the device. The bowl is filled with tobacco and lit and the machine smokes away while the purchaser is assured that the first drafts on the new pipe will not be attended by a bitter taste and a parched tongue. The qualities of tobaccos can also be tested by the invention in a short trial.

PENCIL AND ERASER HOLDER FITS ON TYPEWRITER

Eraser and pencil are kept conveniently near the stenographer's hand in a holder designed to be attached to the typewriter. The device is fastened under one of the rubber supports of the machine by sharp points on a bottom plate, or it is inserted between the foot and the frame by partly unscrewing one of the rubbers and affixing the holder, which has a slot for that purpose. The pocket can be adapted to any shape of eraser, and by bending the metal fastenings the tools are held securely when the typewriter tilts.





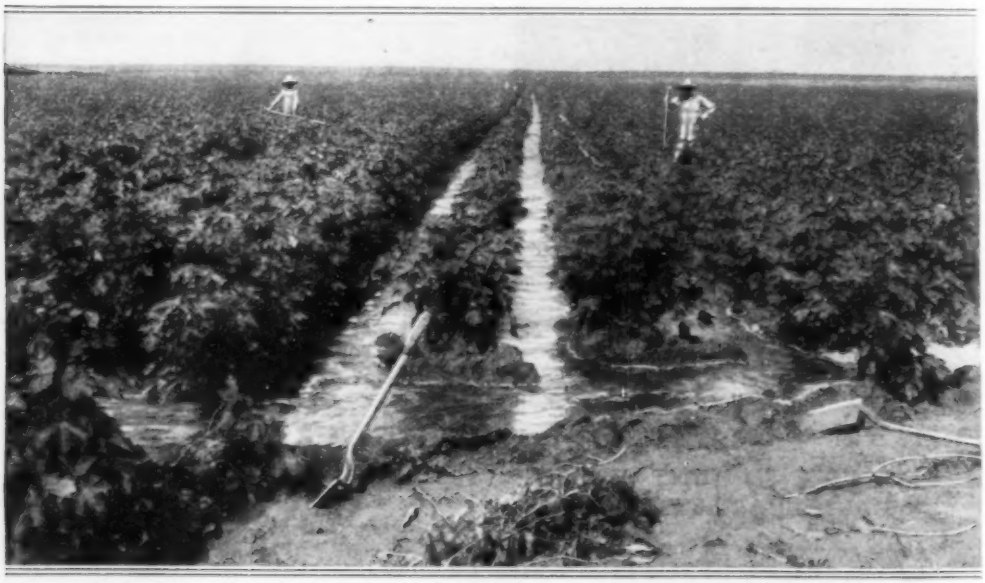
Wire-Mesh "Sand Shoes" that Make Desert Marching Easier by Lessening Strain

SAND SHOES" OF WIRE END STRAIN OF TRAVEL

Made of stiff wire, and larger than the soles of the boots to which they are firmly strapped, "sand shoes" are used by the military forces in Syria, in making long marches over the shifting deserts. These meshed foot protectors distribute the weight over a greater area and give the wearer a better purchase in walking, thus doing away with much fatigue and strain. They operate on the principle of the snowshoe of the cold regions.

"HOT LANDS" RECLAIMED FOR COTTON IN MEXICO

Irrigation has been practiced on a small scale in Mexico, in the valley of the Rio Grande, to grow cotton, but the water supply is far too limited and uncertain to be of value in reclaiming more than a very small proportion of the great tracts of arid lands. On the other hand, the problems that face the agriculturists operating on a large scale in the fertile valleys of the "hot lands," have to do with drainage, as the rainfall is heavy. Such irrigating projects as are carried on, are by means of the usual dam and trench system, with the water flowing between the rows of plants, and being discharged lower down in the rivers. In the few districts in which this is possible, excellent results are obtained, but these rivers are almost dry for several months each year, and sometimes the freshets do not flood them sufficiently for practical use.



Cotton Grown by Irrigation in the Valley of the Rio Grande in the "Hot Lands" of Mexico

¶ Oak timbers in the roof of a London building are as strong now as they were when put in five centuries ago, according to a recent test.

"The Pit," of the Chicago Board of Trade, from which the Rise and Fall of Grain Prices Are Broadcast Daily to All Parts of the Country by Radio

Glimpse Behind Radio Broadcasting Scenes

Strange Mechanical Devices Used to Produce Realistic Effects for Unseen Millions of Listeners

WITH the constantly increasing popularity of radio, broadcasting stations have been forced to devise many ingenious contrivances to give realistic effects to their dramatic programs.

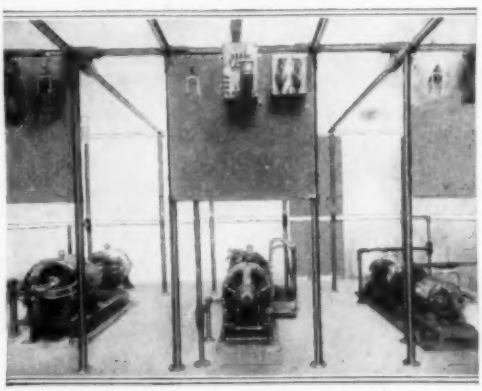
While theater audiences are familiar with the means employed for making stage thunder, rain, hail, hurricanes, pistol shots, and so on, entirely new methods have had to be resorted to for the wireless, because it must be done through the ears alone.

As a result, the average "fan" who listens in on the program would be sadly disillusioned if he could catch a glimpse behind the scenes, for it has been found that the voice alone often fails to give the proper illusion, and mechanical means have been used to help it out for the benefit of unseen hearers.

If an airplane is supposed to pass, the whir of its propellers must be reproduced. Should a house fall in, or a forest fire be supposed to menace the actors, there must be a corresponding sound. The noise of an aircraft, for instance, is produced in lifelike manner by placing an electric fan before the sending device and holding a piece of paper against the revolving blades. By moving the paper back and forth, the impression is given the listeners that the plane is approaching or receding.

When a house is supposed to fall with a crash, the impact is reproduced by some one jumping from a table onto several boxes, which are crushed beneath him. It was found impossible to give the illusion of a burning fire. Even when an actual blaze was started, the effect was not realistic. Finally, the problem was solved by holding a lighted gasoline torch near the microphone.

The sound of a falling tree is produced by bumping a chair about the floor. In broadcasting a dinner scene, the actors do not need any table. It is important, however, that a number of dishes be rattled from time to time to suit the action. Also, it may come as a shock to those who have listened in on love scenes to learn that the sound of a kiss is not made in the conventional manner. The noise results from loudly kissing the back of



Electrical Generators that Supply Power for One of the Nation's Largest Broadcasting Stations

the hand held close to the transmitting device.

From the control desk, a broadcasting station presents an amazing view of complicated electrical meters and switches. At the far end of the room are the generators, and over it all extends an elaborate pipe framework that serves to inclose all of the power wires and support the apparatus.

A push on two buttons starts a pleasing purr from the generators, accompanied by a succession of clicks from the automatic starters attached to the machines as they "step up" the power and bring the speed to the maximum of over a thousand revolutions a minute.

Then an imposing array of tubes resembling huge electric lamps begin to glow. After a minute or so to allow them to become thoroughly warm, another button is touched and the soft drive of the generators changes, the indicator's needles jump ahead, and the station is ready to "go on the air."

Before the director, on the operating table, is a box of complicated switches which connect the transmitter with microphones, or "pickup" devices, strategically located near orchestras in any part of the city. One is marked "studio" and connects with a quiet room where singers, pianists, and other artists are waiting. By placing on his head a pair of telephone receivers connected to a regulation receiving set, the director is able to hear exactly the same sounds that float across the continent and the high seas within a range of thousands of miles.

The control cabinet houses a small amplifier, of the same sort used in a receiving set, and this is switched on in order to amplify the voices and instruments which are waiting the signal to start. Finally the switch is closed, and a red light comes to life on the desk of the musical director in the studio. The announcer, seeing the signal, closes a switch on his table which cuts in a microphone, resembling nothing more than an overgrown and somewhat modified telephone transmitter, and in the head phones of listeners in all parts of the country comes the announcement, "This is W-D-A-P—."

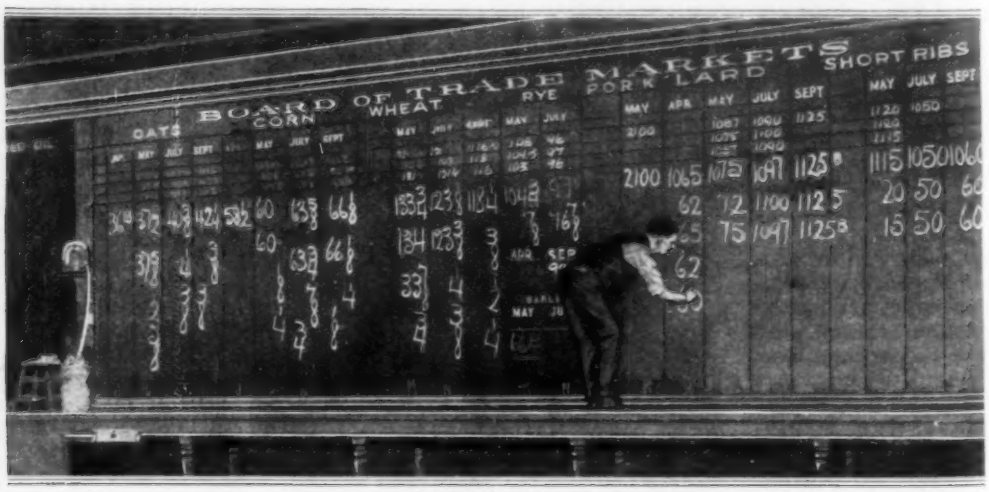
The duty of the operator is to watch all of the meters for indications of trouble in the complicated network of apparatus and to carefully listen to everything coming over the microphone line in order that nothing shall be broadcast that does not come up to the requirements of the United States Department of Commerce, which regulates everything that goes on by way of the ether wave.

Occasionally the circuits are changed at the proper time to connect with an orchestra, giving the studio performers a chance to rest; and at last, about midnight, the announcer in the studio will say, "This is W-D-A-P, Chicago, signing off."

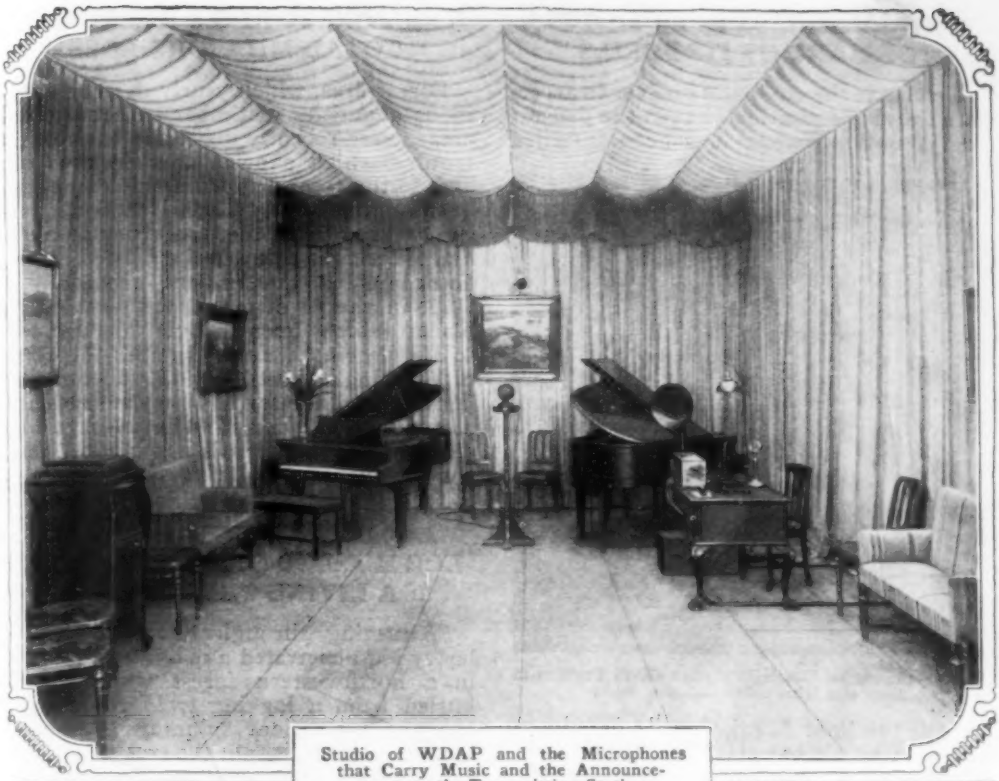
Then the generators are stopped, all of the switches turned off, and the lights put out.

But the next day approximately 400 letters will be received from radio fans commenting on the evening's performance.

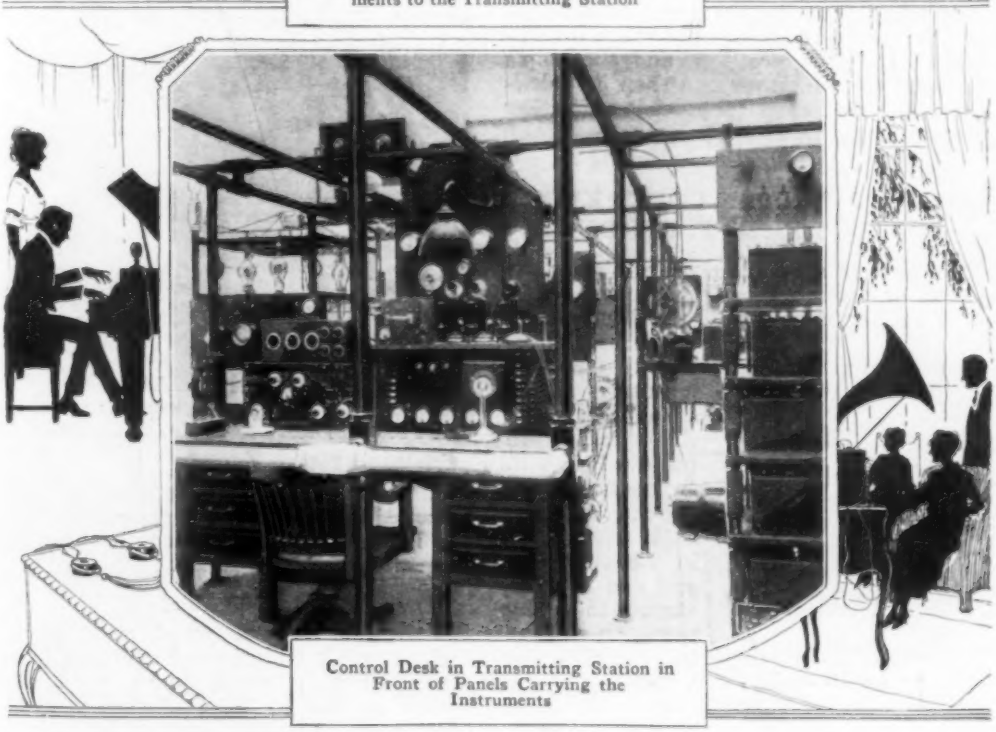
These messages, sometimes in the form of telegrams, come from all parts of the country. Recently, a wire sent from Chicago to an Atlanta, Ga., station, was received there and read back to the sender in approximately 20 minutes.



Board from which Grain Prices Are Broadcast



Studio of WDAP and the Microphones that Carry Music and the Announcements to the Transmitting Station



Control Desk in Transmitting Station in Front of Panels Carrying the Instruments

RADIO COMPASS ROBS THE SEA OF MANY OF ITS PERILS

To enable the navigating officer to ascertain the ship's position in even the densest fog, a radio compass has been installed

Radio Compass on "Leviathan" that Gives Position in Fogs and Diminishes Collision Risks

aboard the liner "Leviathan." By means of this latest aid to navigation, the dangers of running aground or collisions at sea, may be minimized. By means of radio direction finders, bearings are taken on stations of known position, and the ship's latitude and longitude can then be calculated with mathematical precision, whether the sun is visible or not.

RUBBER CAPS ON CORKS KEEP BOTTLES FREE FROM DUST

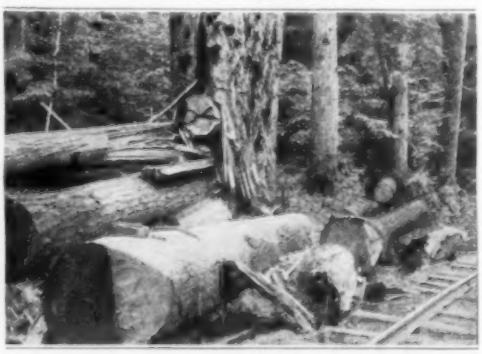
To prevent accumulations of dirt on the necks or around the stoppers of bottles, thin rubber dust caps have been made. They are perforated through the center to fit snugly around the cork, and are removed with it. A collar covers the mouth of the flask. They come in various sizes and can be converted to many uses. One of the larger kind is convenient in keeping the shaving brush handle dry, and one of the smallest can be slipped over a medicine dropper, serving as cork and protector.

TEN FOREST FIRES EVERY DAY TOTAL MILLIONS LOSS

Forest fires, which yearly destroy enormous quantities of timber and reforested areas, were recently made the basis of an inquiry which showed that in the past decade the total loss from this cause had been approximately 646,000,000 feet. For the past few years there has been an average of ten fires a day in the United States, according to government records. In 1921, in the 48 states, there were 38,400 blazes which burned over an area of 4,737,000 acres, whereas in 1922 the State of Washington lost 129,540,000 feet of timber on 68,902 acres, and Oregon 103,847,000 feet on 190,995 acres. The average loss caused by forest fires is about $16,405,000 a year, but in 1921, Minnesota alone lost 30,895,868 dollars.

LOG HURLED OFF TRAIN SPLITS A LIVING TREE APART

Splintering through like a wedge, a heavy log penetrated a massive tree trunk in a northwestern forest when it was hurled from a logging train rounding a sharp curve. Sent spinning as though from a catapult, it split the tree almost exactly in half. The train was derailed. Accidents frequently occur on the forest



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Like a Projectile from a Huge Gun, This Log Split the Tree Trunk

roads, due to the steep grades and unballasted track beds and the speed at which the heavy loads are rushed to the mills from the loading grounds.

¶Made entirely of wood and having eighteen dials which show the time in as many cities, a clock upon which its maker is said to have worked twenty-three years, is being shown in Europe.

PANAMA CANAL SHIPS TIED UP TO CLEAR "SLIDE"

South-Bound Ships Waiting for Dredges While North-Bound Steamers Proceed, After a Minor "Slide" in the Panama Canal Blocked Part of the Passage

Only south-bound ships were compelled to tie up recently after a minor slide in the Gaillard cut of the Panama Canal. Soundings showed that the other side of the passage was navigable, so north-bound boats proceeded as usual while the other steamers were tied up close to shore to make room for dredges sent to excavate the channel. These small cave-ins happen occasionally as the earth settles in the steep cuts, but since the period, September, 1915, to April, 1916, when the canal was practically blocked, traffic has not been impaired seriously from this cause.

AID IN REMOVING SPLINTERS IS GIVEN BY LENS

Aiding the eye in locating splinters in the flesh is the purpose of a household magnifying glass lately introduced. The article consists of an optical lens set into a metallic hoop, the latter being mounted with a hinged joint upon an upright wire standard having an oblong loop at its lower end. A spool serves as a base, the loop being pushed into the hole in the center, and anchoring itself. The lens, which can be adjusted to any desired angle, is also of service in threading a small-eyed needle.

SECRETS OF MAN'S BEGINNINGS TO BE SOUGHT IN MONGOLIA

Before starting on their latest trip of exploration to the heart of the Orient, scientists attached to the expedition of the American Museum of Natural History, New York, declared that it already had been established that Central Asia was the original home of animal life and that it was the "mother of continents." They also expressed confidence that in Mongolia would be found formations that would reveal the secret of man's earliest existence. On a previous trip, thirty-six of the seventy-five camels in the caravan died from privations of the 400-mile march across the desert, where there was no forage. For twenty days men subsisted on scanty rations of antelope meat and tea.

¶ More than $14,000,000 worth of stock, in their own and in an affiliated telephone company, is owned by the employes of a large concern in Chicago.

POCKET CHART TESTS BLOOD BY COLOR MATCH

Tests of the blood can be made by matching its color with those shown on a vest-pocket chart that has lately come into use among doctors. In making the experiments, the patient's finger is first pricked with a sterilized needle and a drop of the blood collected on a piece of white paper. The color is then compared with those on the scale of the instrument to determine the percentage of red corpuscles.

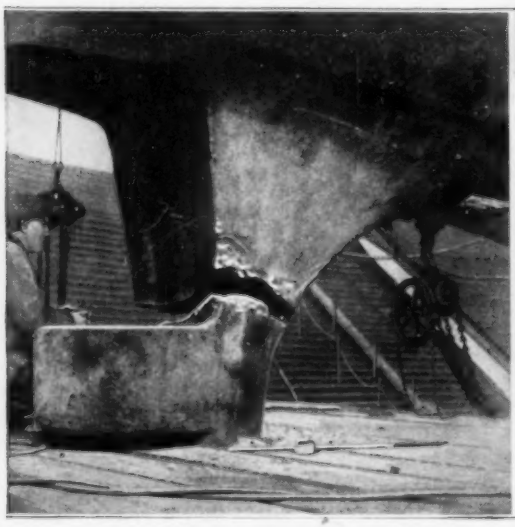
Pocket Color Chart Used by Physicians to Determine Volume of Red Corpuscles in Blood

RADIO "DOT" SPANS OCEAN AT SPEED OF LIGHT

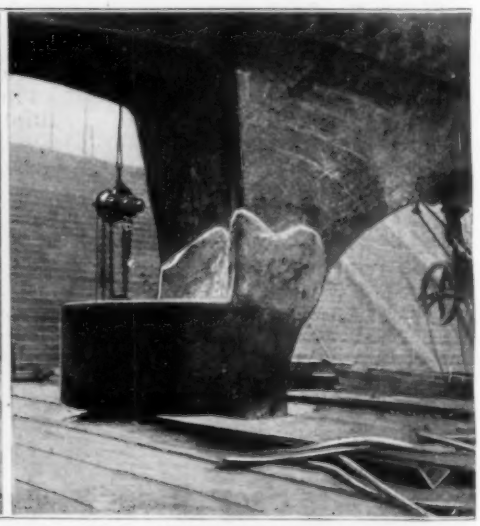
Recent experiments show that radio messages can be acknowledged and checked almost simultaneously with the sending. The tests were conducted over the aerial loop between New York and Warsaw, Poland, a circuit of 8,500 miles. The operator at the control center in America instructed the European representative to "tie up" his receiving station with the transmitting station. A "dot" was then sent out and made the complete circuit from New York to Warsaw and return while the foreign operator was manipulating his key. The Polish operator was then instructed to leave his key and the "dot" raced twenty times around the circuit at a speed of 186,000 miles per second before dying away because of electrical disturbances.

VESSEL KEPT IN SERVICE BY WELDER'S TORCH

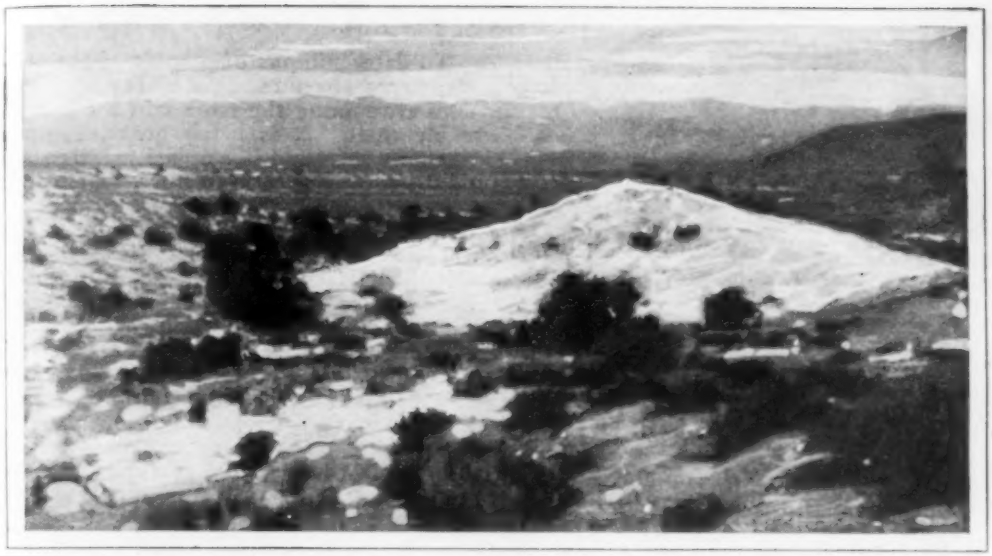
Welding on a gigantic scale was accomplished recently in repairing the sternpost of a great ocean steamship. The attention of engineers was first drawn to problems such as this when it became necessary to recondition the German boats left in American ports at the outbreak of the World War. The results obtained from the method employed exceeded all expectations, and the speed in which the vessels were repaired and placed in commission is said to have astonished the mechanical world. In welding various breaks, it is said, the strength of the metal increases.



Broken Sternpost, Forced into Correct Position, Is Ready to Be Welded



Greatest Marine Weld on Record: Sternpost Stronger than Before the Break Occurred



Its White Slopes Gleaming in the Midst of a Desert Land, the "Mountain of Toothpowder" Has Become a Mine of Material Valuable to Important Industries

"Toothpowder Mountain" Built from Shells

Skeletons of Tiny Sea Urchins Piled Up on Bottom of Prehistoric Ocean Supply Industry with Valuable Rock

FEW materials possess a wider range of uses than is claimed for the white earth that forms a desert mountain in Nevada.

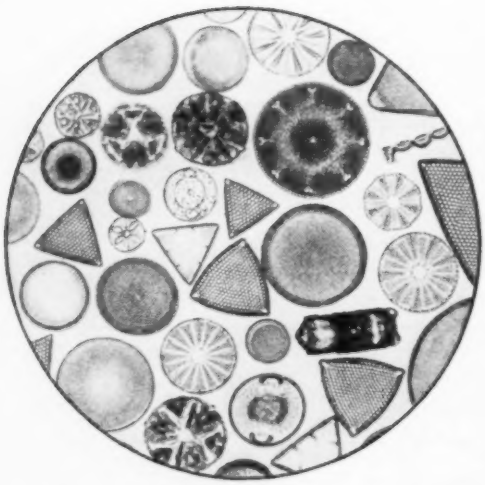
Believed to have been formed when that region was the bottom of a sea that dried up ages ago, the hill contains a deposit of soft snow-white rock which is easily reduced to powder so fine that the fingers can hardly feel its presence when rubbed between the hands. Such earth is generally said to be composed of the skeletons of minute sea creatures which multiply rapidly and die after short lives, leaving their little shells to pile up on the bed of the ocean.

Scientists say that they are everywhere that water is found on the surface of the land. Some attach themselves to foreign bodies while others float freely. Often they are found fastened to the stems and leaves of water plants. When the mite within the shell ceases to live the crustlike covering sinks to the bottom carrying within it the tiny skeleton and helps to form the sediment. This accumulation in time turns to almost solid rock.

The "mountain of toothpowder" is reported to have been discovered by a tired prospector who gave to it its name. While driving his burro to a place of shelter, he passed the peculiar white mound. Struck with its dazzling shade he chipped off a bit of the substance and grinding it into fine particles he examined it and even attempted to scour his teeth with it. Then he polished the metal cooking utensils he carried about with him and traveled into the nearest town to proclaim his discovery

It is an easily workable material, which may be lifted from the deposit in large blocks and readily reduced to powder form. The angular shapes of the minute particles make it a valuable ingredient for polishing and grinding mediums for glass and metals. Its absorbent quality fits it suitably for use in the manufacture of dynamite, while as a filtering material, it is claimed to be unsurpassed by anything else yet known. Inasmuch as it resists the conduction of heat, it has been employed in insulating steam pipes and boilers. In like manner, the white earth has been used with great success for filling in the walls of buildings to make them soundproof.

Its almost pure condition and the fact that it does not contain harmful substances have won it a place as a base for various medications that are used as dusting powders for wounds. Cosmetic mak-



ers have also taken it up as part of preparations for nail polishes, and manufacturers of shoe dressings have made of it a cleanser for both white footgear and gloves. One of its prime uses is as a toothpowder, its absorbent features and freedom of acid making it a precious part of many dentifrices.

Each cell of the "diatom," the name given by science to the lively little plant animal which is credited with the creation of the valuable hill, is provided with a shell that has two halves. Inside these coverings the magnifying glass shows wonderful scrolls and natural sculpturings. The shells are in an almost endless variety of shapes. Some are circular and oval, and others are long, angular, and crescent-shaped, while still others resemble tiny boats and stars.

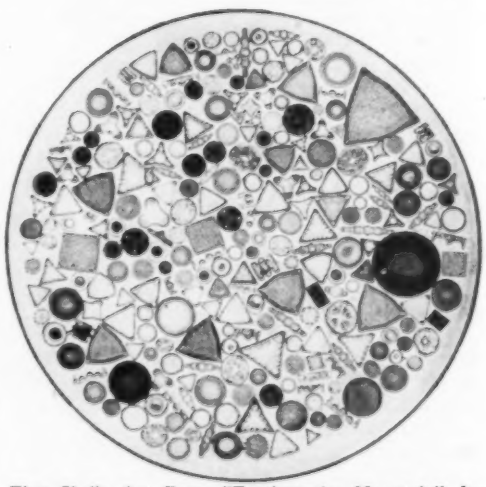
When alive, diatoms are found existing singly, but more often in colonies that are united in great branches, zigzag chains, and ribbonlike formations. Their average size is less than one two-hundredth of an inch. Seldom are they larger and the majority are much smaller.

Experts have not yet determined by just what method or at what time in the age of the earth this mountain of powder was cast up above the land. But probably no purer material of this sort exists anywhere else.

To date, millions of pounds of the substance have been removed by the operators who are mining the mountain for its valuable earth. It is being quarried much like soft rock and is shipped in this state to the points of manufacture, where it is made into the various degrees of fineness that the different products require.

Just how far the mountain extends below the surface of the desert has not been definitely learned, but since it has stood for ages in the midst of wind-shifted sands, it is supposed that its actual base lies far beneath the ground. Scant vegetation surrounds the hill, and practically none at all takes root on its snow-white slopes.

Probably many years will pass before a material decrease in the size of the toothpowder mound will be caused by withdrawals of the rock. While chemistry and industrial processes may find additional uses for the product in the course of time, there is always the chance that science will be able to discover other deposits of the kind ere the millions of tons lying in the mountain become entirely consumed. And the tiny organisms that caused it continue to grow.



Tiny Shells that Form "Toothpowder Mountain" Are Found to Be in Almost Every Imaginable Shape

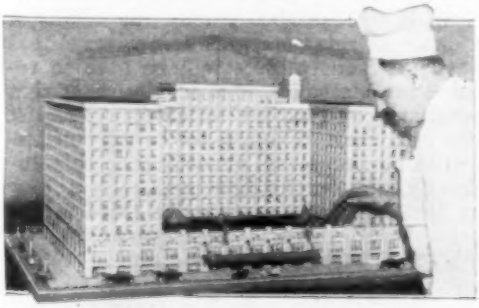
AIRCRAFT "HOOKED" TOGETHER IN TEST FLIGHT

While the "Silver Whale" Forged Majestically Along, a Tiny Messenger Plane Darted Under It, and Held Contact for a Full Minute by a Rod and Trapeze

That an airplane can be linked to a dirigible while both are in rapid flight has been proved by recent army tests. With both craft going at the rate of fifty-seven miles an hour, a rod was extended above the top wing of the plane and fastened at the lower end with elastic so that the pressure would not tear the framework. At the same time, a trapeze arrangement was let down from the airship. While both flew along, contact was established and maintained for a full minute. Aviators declare the experiment indicates that large aircraft may be constructed to act as "mother-ships" for fueling and supplying ammunition to small planes.

MINIATURE AERIALS IN CANDY DISPLAY HOTEL'S RADIO

Arrangement of the aerials on the broadcasting station of a Chicago hotel was effectively displayed at a recent radio exhibition from an exact model of the structure fashioned entirely of candy on a cardboard frame. The relation of the main wires attached to a central pole, the distinguishing feature of the station, was clearly shown, the equipment being complete in every detail. At the same time, visitors were able to study the architecture of the hotel, which was faithfully reproduced by the chef's skill.



Putting the Finishing Touches on Candy Masterpiece Which Showed Arrangement of Hotel's Aerials

WHALE RAMMED BY SHIP'S BOW HALTS VESSEL'S VOYAGE

When speed of the United States Navy transport "Argonne" was retarded suddenly without apparent reason, during a recent voyage, it was discovered that a whale had become impaled upon the bow of the vessel. According to one of the crew, the ship had rammed the monster and broken its back.

MILK BOTTLE AND CAN LOCK TO GUARD AGAINST THEFT

Bottles of milk and canned goods are locked securely from the hands of thieves and breaking and spilling are avoided by

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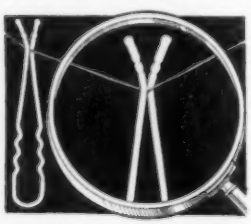
Until the Door Opens, the Bottle Cannot Be Pulled from the Spring Clip

the use of a clip which locks the containers to the house door. The device springs shut when a bottle or pail is inserted and cannot be loosened until the door, swinging open, releases the jaws of the clip. It is placed at a convenient height so that the owner does not have to stoop to pick up the articles.

GRIP NEAR HAIRPIN'S POINTS KEEPS IT IN POSITION

Hairpins that hold their grip by compression have recently been placed upon the market. Made of wire or celluloid, the latter in three colors, these novelties are fashioned upon a principle which gives them a firm hold on the hair. The lower halves, in addition to the usual "waves," are bent inward until they touch just above the ends, and the points spread apart, which gives them a firm anchorage.



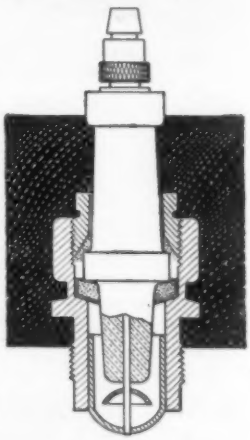
¶So that it may be moved from one room to another, a new dining table is built with a tilting top.

WIND DIRECTION PLAYS PART IN PLANNING OF CITY

Prevailing directions of the winds largely determined the location of a proposed industrial district of a mid-western city recently. Records were consulted as far back as 1879, and it was found that the winds most of the year were from the south. Consequently, it was decided to build the factory district northeast of the city so that the winds would carry the smoke away from the residence areas the greater part of the time. Builders in other cities have seen the importance of gathering data as to the course of the winds before starting civic projects, and the information supplied by the weather bureau is of increasing value on account of the growing smoke nuisance.

SHIELD PROTECTS SPARK PLUG FROM OIL AND CARBON

To make it carbonproof, a spark plug recently patented has a metal shield in its shell from which the oil drops off, thus protecting the core. It is claimed that the plug cannot foul, regardless of motor conditions, so that perfect firing and smooth operation are assured, and crank case dilution minimized.



RELAY TOWERS TO BROADCAST RADIO TO FIFTY MILLIONS

Broadcasting radio programs simultaneously to 50,000,000 persons by means of a chain of relay stations so powerful that even inexpensive sets will be able to receive the messages, is a development that soon may be realized, an eastern scientist has predicted. From three to six stations would be necessary, according to this authority, one on the Pacific Coast, another on the Atlantic Coast, and a third in the central Southwest. Others might be erected in foreign countries, and all would operate on the same wave length to prevent overlapping. Such a system would cost approximately $5,000,000 a year.

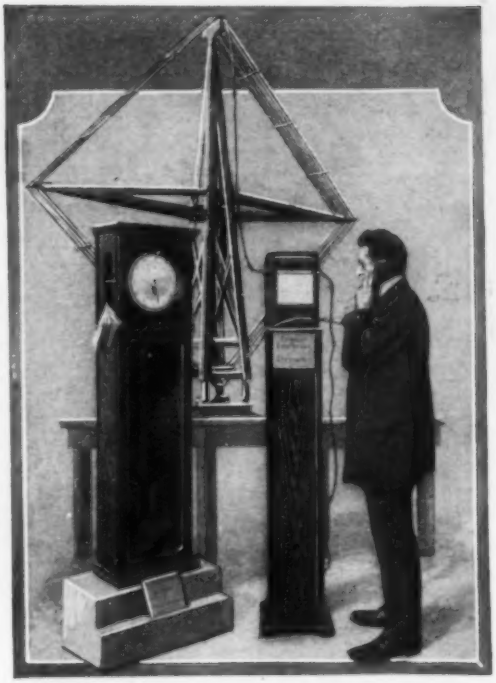
GERMANY'S CLOCKS ARE SET BY WIRELESS

Regulating all the clocks of the nation by wireless and with the aid of but a single station, is the aim of a German institution which has established two experimental structures. One of these is near Berlin and the other is located at a distance, on the summit of a high mountain. Twice every day the time signal is broadcast for the benefit of government offices, railroads, industries, individuals, and ships approaching the coast.

A special law prohibits any other radio station in the country from operating during the period of seven minutes required by the regulating broadcaster to complete its work. All other wireless traffic is interrupted and the paths of the air reserved for the time corrector. Five different signals are sent out, beginning at 12:55 o'clock, midday. Each of the first four occupies about a minute, being the same sign repeated for that length of time. When the 59th minute arrives the correcting code is released and lasts until the expiration of the hour.

During the passing of the preliminary signals, the receiving operator is supposed to prepare to adjust the clocks under his charge for the regulating message. For this purpose a special receiving device is necessary. It is made and leased by the sending organization to the subscriber. After the receiver has been installed, all that is needed is for its attendant to apply the phones to his ears when registering time is announced by the radio station. He then follows the message through, comparing the timepieces with the signals. Printed on the recording device is a copy of the code, so that the operator can read the signs as they are sounded.

Schools have been opened for watchmakers, wherein they can learn the meaning of the codes and the manner in which they are to be used in the adjustment of clocks and watches. They also receive training in the construction and upkeep of the radio apparatus employed to send and receive the messages.



Aerial, Receiver, and Regulator that Compose Part of Wireless System for Setting Nation's Clocks

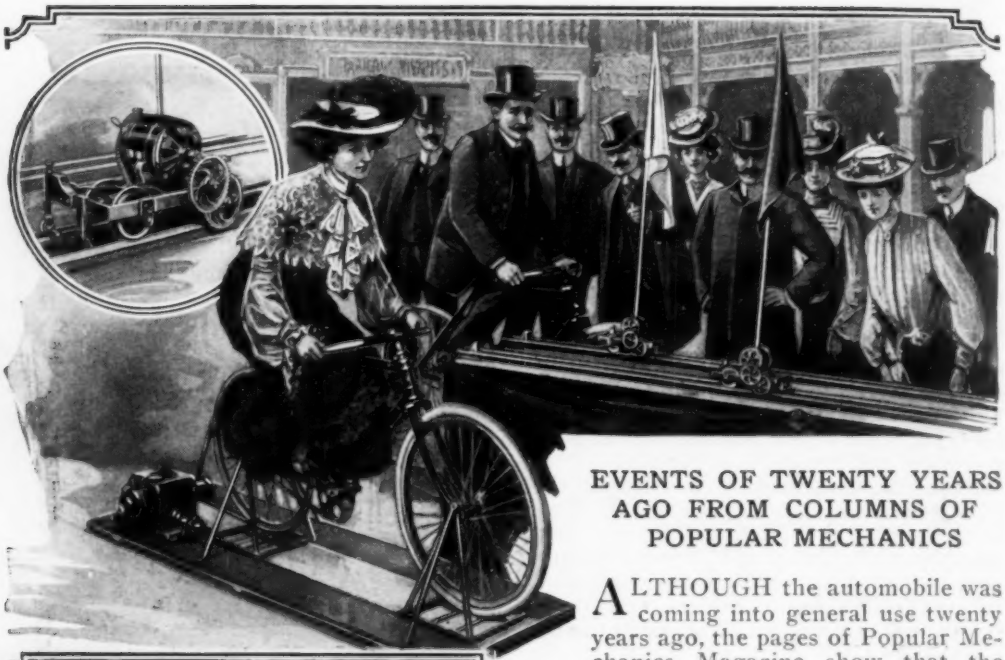
Of the two wireless stations, one gives the first signal and the second, to which it is connected by cable, automatically begins the timing of the code and broadcasts it without further aid. The two hours of the day selected for the regulating signals are one o'clock a. m. and one o'clock p. m., corresponding to noon and midnight at the Greenwich observatory, according to the system used in Europe.

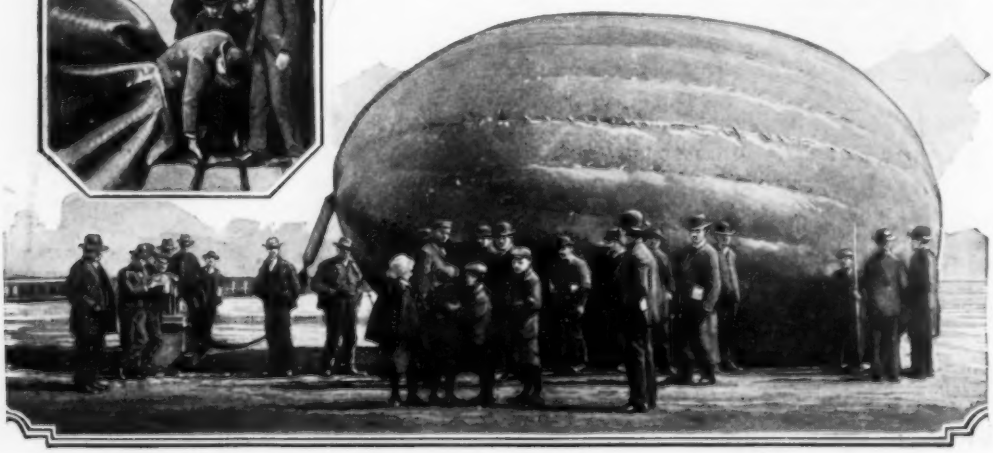
BLOWTORCH HAS DETACHABLE IRONS FOR SOLDERING

Introduced to the hardware trade is a convenient combination of soldering iron and blowtorch in which the flame is created by gas generated from wood alcohol. The handle, which is the fuel chamber, contains a wick to be saturated with the alcohol. A small pan is attached under the holes in the gas tube which is filled three-quarters full of the liquid, ignited, and permitted to burn out, thus generating the gas which issues from the holes.

Combination Tool for Making and Mending Metal Articles

¶Whenever you find that you wish to know more about any article in the magazine, write our Bureau of Information.





EVENTS OF TWENTY YEARS AGO FROM COLUMNS OF POPULAR MECHANICS

ALTHOUGH the automobile was coming into general use twenty years ago, the pages of Popular Mechanics Magazine show that the bicycle at that time still retained much of its popularity as a means of sport and transportation. This is indicated by the pictures at the top of the page. These were taken at a "race," where the wheels were held stationary in a frame while the "mileage" of the riders was recorded by an electrical device. In the same year Chicago built its first subway, shown in the center, which is still in use, but for freight only. The two bottom views are of a giant air bag, inside of which its inventor tried to make a trip across Lake Michigan but lost his life in the attempt.

OIL-LINE CLEANER FOR AUTOS PREVENTS ENGINE TROUBLE

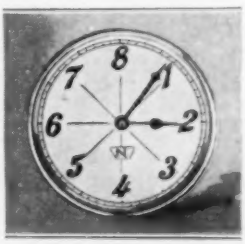
For use on small automobiles, an oil-line cleaner has been invented to insure a constant flow of oil through the engine and to make unnecessary the removal of the radiator, timer or other parts when the lubrication becomes clogged. The device consists of a pet cock attached to a bracket and fitted over a small hole bored in the crank case. A flexible cable, long enough to reach the oil line, is inserted and removes any obstruction.

SECRET OF BANK-NOTE PAPER KEPT TWO HUNDRED YEARS

Closely guarded, the secret of making the linen tissue for Bank of England notes has been kept for 200 years by the trusted employes of one firm. Of a peculiar whiteness, the paper is so tough that a folded note can sustain a weight of fifty pounds without tearing. The same bill is never paid out twice by the bank. If a customer receives the proceeds of a check in fresh notes, and immediately deposits them, they are canceled and retired. In the days before postal orders became common, it was customary, when sending money by mail, to cut a note in halves, inclose the first with the invoice, and await acknowledgment before parting with the second.

EIGHT-HOUR CLOCK CUTS DAY INTO THREE EQUAL PARTS

Changing conditions, as illustrated by the eight-hour law for railroad employes, have brought about the development of a new kind of timepiece that divides the day into three watches of eight hours each: "Morning Hours," denoted by the letter M, which appears in an opening in the dial, "Noon Hours," indicated by N, and "Evening Hours," designated by E. The first period begins at midnight, the second at eight a. m., and the third at four p. m. Heretofore, most timekeeping devices have had twelve divisions on their faces, although Southern Europe has long favored the twenty-four-hour clock.



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"FILLING STATION" FOR PENS WORKED BY CENT-IN-SLOT

For the convenience of fountain-pen users a penny-in-the-slot "filling station" which eliminates the waste and untidiness

Loading a Fountain Pen with Ink from a Penny-in-the-Slot "Filling Station"

of the open inkwell has been devised by a western inventor. It consists of a chamber and filling-cups inclosed in a case composed of metal and hard rubber which stands upon a writing desk or table. When a coin is inserted in the slot and a knob turned, ink sufficient to fill one pen runs into one of the cups. The pen is loaded from this, a dropper being provided for those not equipped with self-filling mechanism. A wiper attached to a spring reel is pulled out from a slit near the knob for cleaning the pen, and extra ink is poured into a refuse cup from which it runs into a waste chamber. The "station" holds sufficient ink to fill 600 pens, weighs only a few pounds, and has no complicated machinery to get out of order. It has been found especially convenient in hotels, schools, and public writing rooms.

¶Native to Mexico and Central America, the chayote, a vegetable having the qualities of the cucumber and squash, is now raised in the Gulf Coast regions of the United States, where it is winning popularity because of its delicate flavor and the beauty of the flowers of its vine.

RADIO SET FOR POLICE ALARM STRAPPED TO "COP'S" BACK

Wireless sets are carried by policemen in parts of Germany by which they can receive alarms and orders sent out by radio

German Policeman Equipped with Wireless Set to Receive Alarms and Orders from Headquarters

from headquarters. The aerial is fastened to the officer's back by shoulder straps and the receivers are held close enough to his ears so that he can hear any message or signal broadcast. The box is suspended across the man's chest within easy reach of his hands. This arrangement permits a hasty mobilization of the guardians of peace in case of trouble.

DOUGH POURED IN OVEN WHEEL COMES OUT ICE-CREAM CONES

Untouched by human hands, ice-cream cones are turned out at the rate of 2,000 an hour by a recently perfected machine shaped like a large paddle wheel, that forms and bakes them while it makes one complete turn. Released from a mixing tank, the batter flows into the cuplike spokes of the revolving oven, and in 95 seconds emerges as crisp cones which drop into carriers that convey them to where they are automatically deposited in racks. They are then stored in cartons by an operator. Thus, hand labor is reduced to a minimum and a uniform quality of product is maintained.

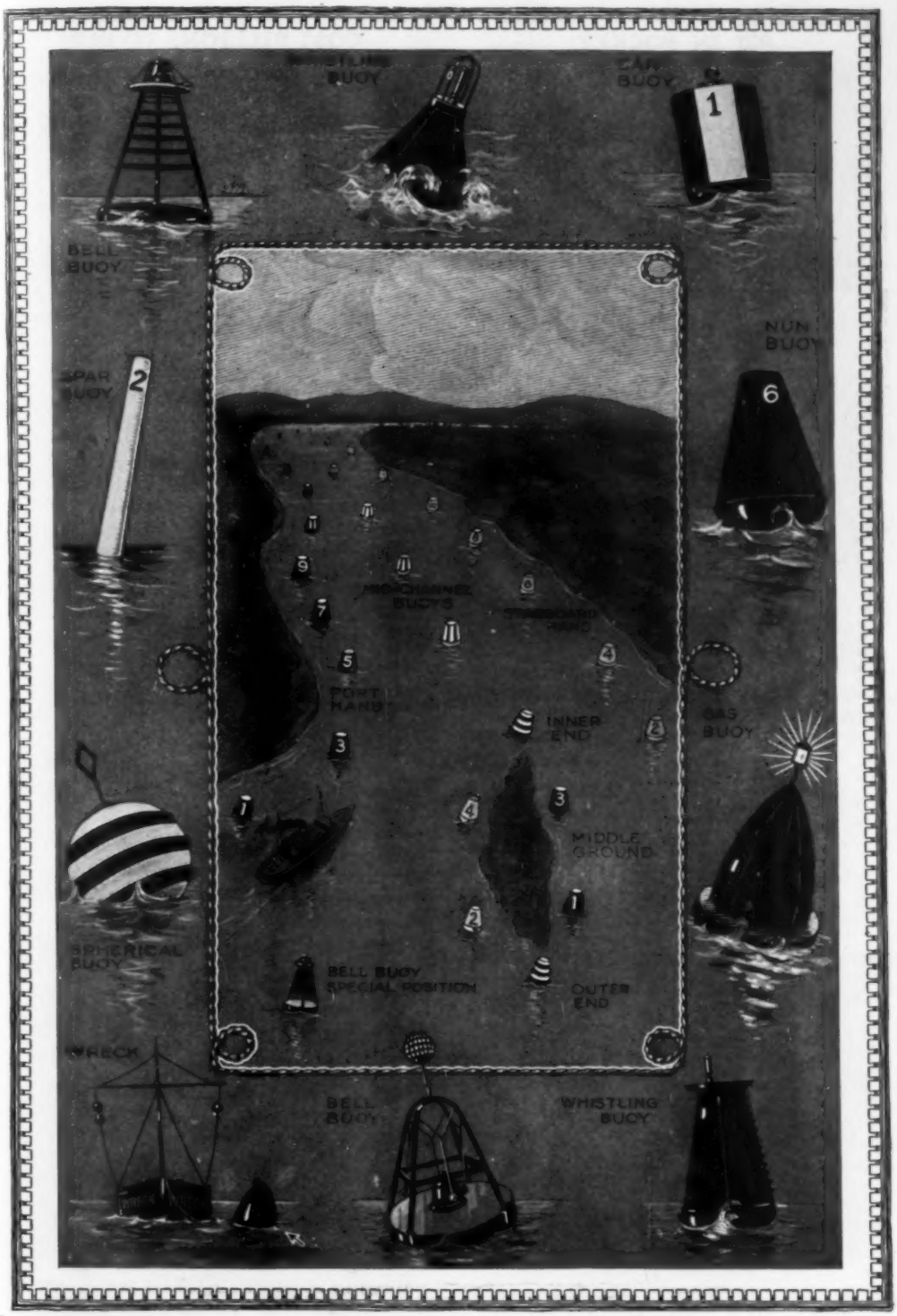
SILENT SENTINELS OF THE SEA GUARD TRAFFIC OF SHIPS

Buoys, signposts of the sea, mark the channel limits of harbors and guide ships to anchorage when entering ports. Like the crowded streets of big cities, the approaches to busy parts of the ocean highways are dotted with fixed caution signals that spell intelligent directions to the mariner. These floating guideposts vary in size and construction from a painted log of wood to steel gas buoys that carry lights which are never extinguished. Some operate whistles and bells that are sounded by the action of the waves. Most of these are found in dangerous spots guarding hidden rocks or reefs, or marking the position of sunken wrecks. Where buoys appear in the open seas, they usually indicate the points at which telegraph cables pass, and often signify the presence of mined or torpedoed grounds. In all there are more than twenty different kinds in use.

METER FOR LOADING CHUTES MEASURES COAL OR GRAIN

Fine coal or other granular material can be measured while being fed through a vertical or sloping chute by a meter invented in England. The register has a counting dial on the outside of the feed pipe which shows the amount. Experiments, it is said, have demonstrated that the recorder can reach within 2 per cent of accuracy. The instrument is also suitable for tallying grain, cement, or crushed coke. Lubricating can be done while it is in operation and it may be removed for inspection or cleansing.

¶Radio loud speakers were successfully used in place of "barkers" and "ballyhoos" at a recent southwestern state fair. They were also used to direct large crowds to the various exhibits.



Signposts of the Seas that Serve Mariners as Guides and Warnings at Entrances to Harbors, Over Anchoring Grounds in Ports, and to Indicate Hidden Dangers Near Traffic Lanes

RADIO SETS IN MINIATURE FIT IN POCKET

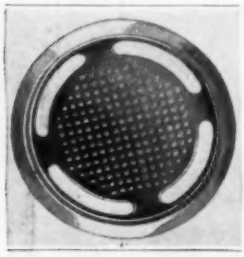
Midget-size radio sets, in various designs, were shown at an exhibition recently held at Chicago. A telephone receiver

Two of the Smallest Complete Amateur Radio "Hookups" that Have Ever Been Made

served as the cabinet of one, another was inclosed in a miniature keg, and a third was in the form of a coil which was carried on a lead pencil. Small as they are, these little "hookups" give excellent results, requiring no aerial other than a piece of wire which can be hung out of the window.

GRATER FITS DISH, SAVES FOOD PARTICLES

Intended for grating vegetables, chocolate, or similar substances without waste or spilling, a grater has been invented which fits snugly on the rim of a cup or measuring bowl and causes the particles to fall directly into the dish. The device is held in place by a lip which curves over the edge of the vessel and the article may be rubbed over its rasping surface. The utensil is made of tin and its openings are so arranged that they can be easily cleaned.



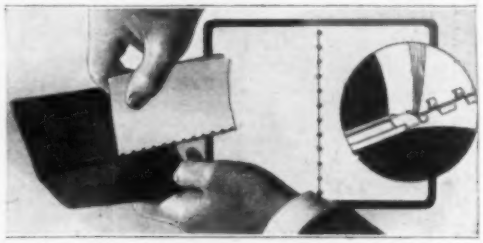
¶White arsenic is being produced in a Montana gold mine as a profitable by-product.

AUTOS WORTH TEN BILLIONS COST BILLIONS TO RUN

Official estimates place the number of motor vehicles owned and operated in the United States at 14,000,000, the investment represented being about $10,000,000,000 and the total cost of maintenance close to $5,600,000,000 a year. This amount is said to equal more than half of all taxes. It is contended that payments made by owners of motor vehicles for highway service should be in proportion to the benefits received; that taxation should not be uniform but should correspond to the highway facilities of the different states.

SLOT TAKES PLACE OF RINGS IN THINNER NOTEBOOK

Opening flat and weighing considerably less than similar notebooks, a loose-leaf holder for memoranda has been devised that is quickly filled with a "cartridge" of perforated pages. Into the one-piece cover is fastened a grooved metal slot for fastening the filler. This is inserted in one movement on a clip arrangement of metal slips. The pages are securely held, do not



How Pages on a Metal Clip Are Inserted with One Movement into Notebook

stick or become loosened while being turned, and the rings are so small that they add but little to the weight of the book.

EGGS SCOURED WITH SAND TO CHEAT PUBLIC

Food inspectors in California are reported to have discovered that storage eggs whitened by a "sand-blast" process which made them look as though freshly laid were in the markets. Stains and discolorations had been removed and all evidences of handling so successfully eradicated that university experts, who attempted to select the freshest from a carefully chosen lot, picked those that had been scoured by the sand treatment. The effects last only a few days.

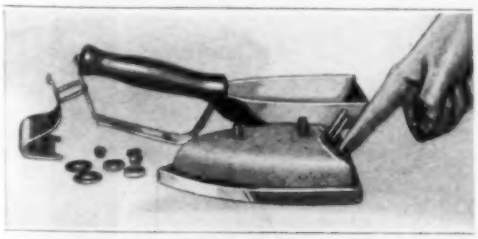
MILLION-YEAR-OLD MONSTERS IN THE MOVIES

Posing Model of a Prehistoric Monster under Powerful Studio Lights for a Motion Picture. Realistic Backgrounds and Settings Are Chosen to Give the Film Scientific Value

So students may more clearly visualize the tremendous changes that have taken place since the world was young, papier-mache and plaster models of monsters that stalked the earth millions of years ago are being made by a European scientist, who shows them in movies with specially designed backgrounds of the proper period. Lifelike figures of animals and vegetation during prehistoric ages are created

HEAT OF ELECTRIC IRON HELD BY CORE OF SOAPSTONE

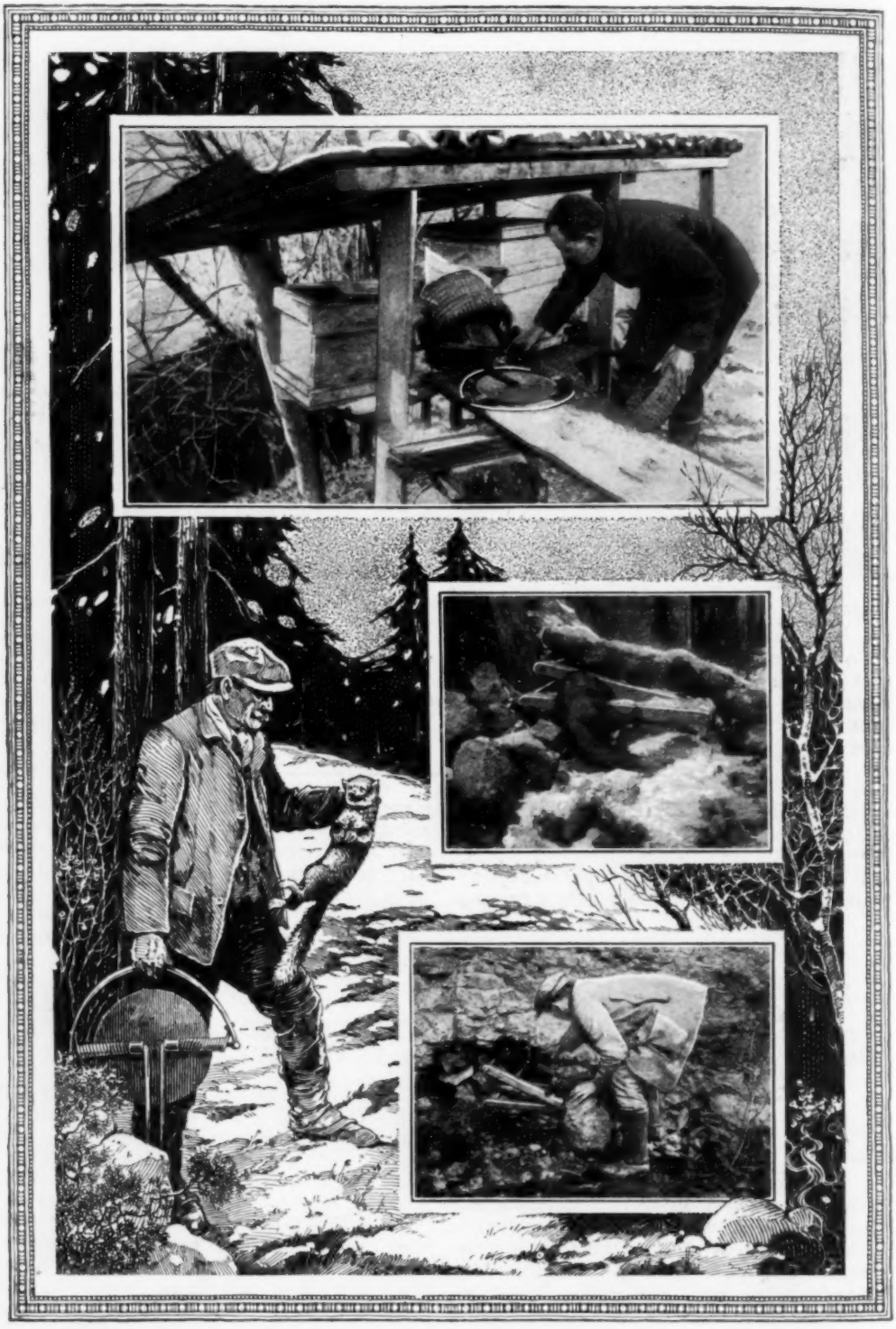
Holding a working temperature for twelve to forty-five minutes after having been disconnected, is the recommendation of an electric flatiron recently introduced to the hardware trade, and it is said to consume less current and costs less to operate than does the ordinary iron. It has a soapstone core which is held in close contact with the base of the implement by metal studs, and is heated by wires running through it in channels, which in seven minutes furnish heat sufficient for use. The steady application of current necessary when using the ordinary utensil results sooner or later in a short circuit, but, it is stated, this newer pattern can be heated continuously for 1,000 hours without detriment.



Electric Iron that Maintains a Working Heat Forty-Five Minutes After Current Is Shut Off

EAST-BOUND SHIPS LIGHTER THAN THOSE GOING WEST

Scientific experiments to ascertain the possible effect of the direction in which a ship is going upon its weight-carrying capacity, recently made by a prominent scientist, resulted in his conclusion that a 2,000-ton vessel traveling east offers 400 pounds less resistance to the water current than it does when west-bound. This calculation, it is said, is based upon the influence of centrifugal force, which is greater when a body is riding with the tide in the direction in which the earth revolves, than when headed the other way.

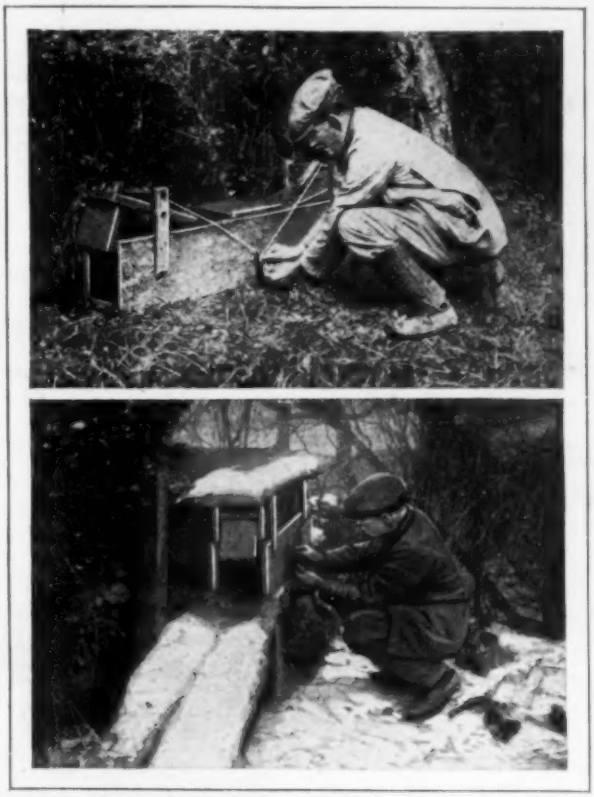


Above: Disguising a Trap from a Honey-Stealing Animal. Center: Beach Marten Caught on a Winter Prowl. Below: Old Stone Wall Used to Hide a Snare for a Skunk

High Prices Urge Trapper in Quest of Fur

SO rapid has been the growth of the demand for fur garments that the manufacturers of such products have been forced to import a yearly supply of skins that is estimated at a value of more than one billion dollars.

Most of the pelts that form these shipments are taken from small animals trapped in the north of Europe and in Siberia. Even skins of animals formerly considered of little value, or entirely worthless, have been pressed into service and pass to market under various trade names that disguise them as completely as does the process employed to change their appearance.



Above: Setting Trap Under a Thick Hedge. Below: Camouflaging the Snare with Snow

The phenomenal rise in values of dressed skins has led to an enormous increase in the army of hunters and trappers who annually invade field and forest in search of the wary little fur bearers. During the trapping season more than 1,000,000 shipments of fresh hides arrive at the fur markets of St. Louis, the chief center for distribution in the United States. The estimated total value of this collection is placed between $50,000,000 and $60,000,000.

Contrasted with the catch that reached the same point in 1877, which numbered but 12,386 shipments, the figures are beyond comparison. At that time, too, there was possibly an animal population several times as plentiful as it is today. In 1810, skins that brought not more than $30,000 represented the year's supply, and many of these probably went begging for buyers. Now, not a single skin is ignored by the eager traders who purchase for the manufacturers of the eastern cities.

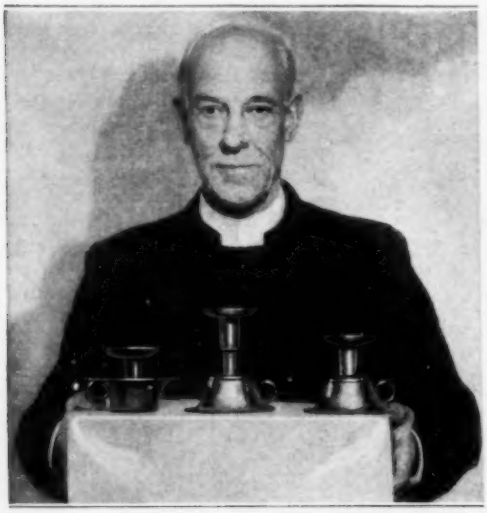
Fashion and the general popularity fur garments have attained in the past decade brought prices of the velvety hides, in many cases, from a few cents a skin to almost an equal number of dollars. Rodent pests whose only claim to existence a short while ago seemed to be to pester the grain bins, chicken yards, and crops of the farmer, now have a fur value that causes them to be hunted in practically every neighborhood where they are known to live.

The market for furs is represented in every state of the Union, for it is a fact not generally known that with the exception of Florida, there is no commonwealth which has not experienced temperatures as low at one time or another as zero.

With this nation-wide demand for fur, the animals that bear it are receiving more and more attention from sources heretofore little concerned with their commercial worth. The peak of prices for skins was reached about three years ago, and although several kinds and grades have dropped from 20 to 25 per cent, their values are still high. In four years the price of beaver skins advanced from $17 to $38.50 each, at the dressing centers. Otter hides went from $14 to $101, and the once-scorned muskrat that brought only 36½ cents before it became popular, reached the almost unbelievable figure of $5.10.

CANDLE SOCKET IN CYLINDER TO GIVE BETTER LIGHT

Equipped with a socket which can be raised or lowered in a cylinder, a "telescopic candlestick" has been patented recently. By using the device the entire candle may be consumed without sputtering.



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Candlesticks with Telescoping Cylinders that Permit the Wax to Be Consumed without Sputtering

PANAMA CANAL TOLL PROFITS FOR UNITED STATES GROW

Returns from Panama Canal tolls, according to United States government reports, are surpassing the profits of the postoffice. From May to October of 1923, the canal showed a margin of nearly $12,000,000, with a high month's record of $2,124,830 for July. During the first six months of last year 2,604 commercial vessels passed through the channel, an increase of 1,091 over a like period in 1922. Approximately $375,000,000 was expended in building the waterway.

BUGS, NOT COLD, TAKE BIRDS TO SOUTHERN CLIMES

Scarcity of insects, owing to the approach of winter, and not cold weather, causes birds to start south when the frosts arrive, according to a western scientist. Seed or flesh-eating fowl, unaffected by the lack of bugs, survive all year as far north as the Arctic Circle. While migrations are largely determined by the food supply, it is believed that habits inherited from the glacial ages partly influence some species. The tern makes a continuous 11,000-mile flight between the polar regions of the north and south, while the golden plover, which spends its summers in the Arctic and its winters in South America, goes first to Nova Scotia as it starts southward, then flies 2,400 miles to Brazil. Due to the mating instinct, experts believe, the spring flights of the birds are more regularly timed than are those of the fall.

SCOOP NET ON STEAMER'S BOW SWELLS CATCH OF FISH

Saving the labor of lowering and raising heavy seines, fish are caught and deposited on the deck of a steamer by scoop nets and belt conveyors attached to the bow of the boat. As the vessel passes through the water, the fish become imprisoned in the meshes of two traps suspended on steel frames and set about 12 feet below the surface of the water. An endless chain of conveyors, running to openings at the bottom of the cages, catch the struggling captives and carry them to the deck.

Copyright, Underwood & Underwood

Scoop Net on Steel Frame and Belt Conveyors Attached to a Fishing Steamer

¶Finger prints are said to have been forged successfully.

ROCKET LINE TO SAVE LIVES OF SHIPWRECKED

Rocket Being Used to Carry Life Saver's Line to Wrecked Ship: This Method Has Been Adopted to Do Away with the Cannon Formerly Employed for the Same Purpose

One of the recent developments in the life-saving service is the rocket line, an innovation having the following advantages over the older method: it is always ready for emergency, and there is no cannon to be loaded in a heavy storm. A light line is attached to the powerful rocket which lies in a trough that has been carefully "sighted." The fuse is then ignited, and the rocket soars from its trough and crosses the hull of the ship with the line trailing.

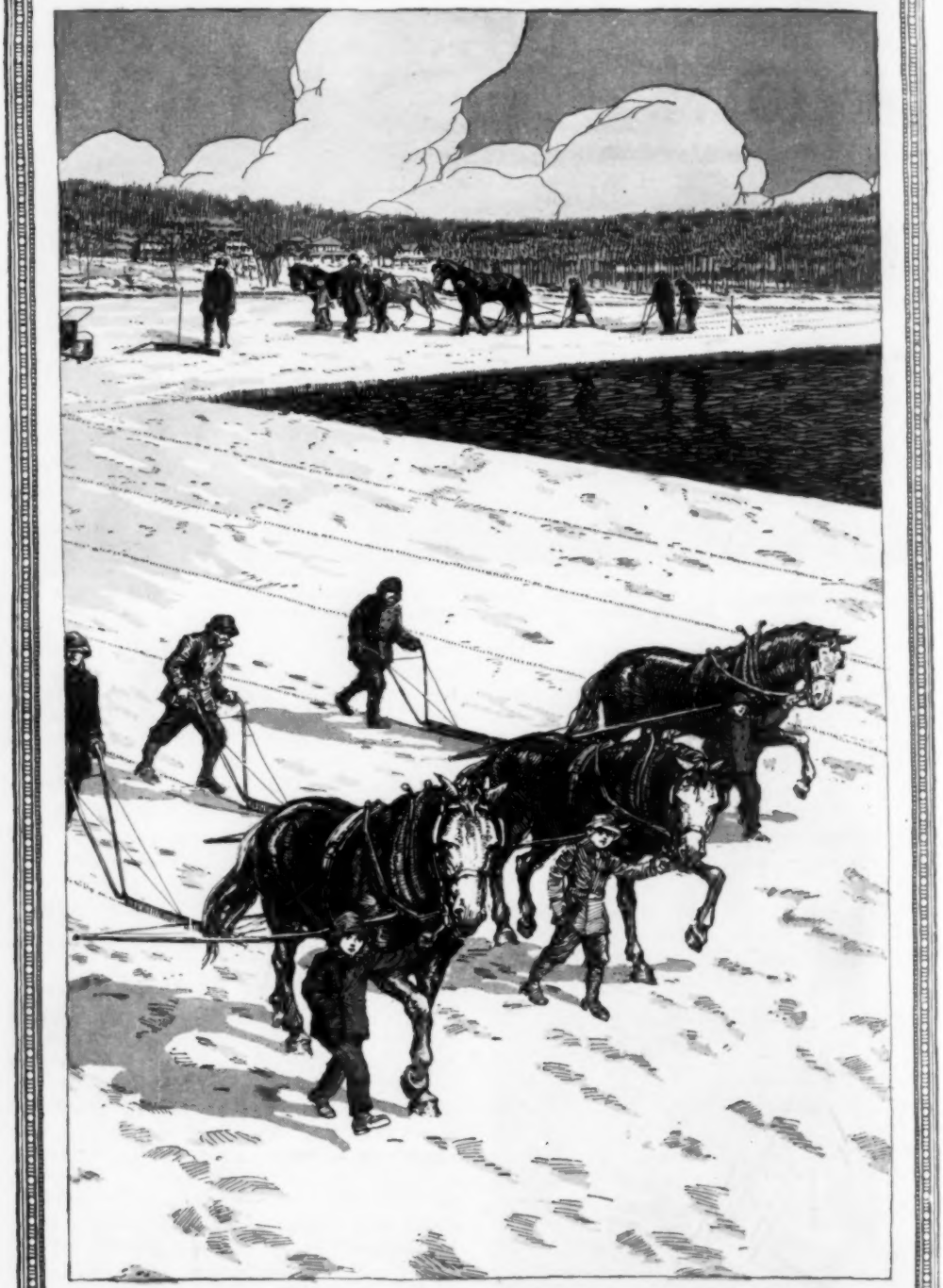
CITY GIVES FIREMEN BROOMS TO FIGHT BRUSH BLAZES

Brush fires, caused by matches or hot cinders, have recently broken out in great numbers in the East End district of Pittsburgh. The firemen have found brooms extremely useful in beating out these persistent ground blazes, and at present the broom forms part of the equipment of every fireman in the service of the city.

Fire Fighters Equipped with Brooms Ready to Extinguish Brush Fires that Menace City

MEN OUTNUMBERED BY WOMEN IN CENSUS OF WORLD

That there are more women than men in the world, is the conclusion drawn by a statistician after recent researches. Among the 475,000,000 inhabitants of the earth, there are 250,000,000 women, 25,000,000 more than the number of men, his figures show. In Germany there are 1,026 women to each 1,000 men; in Russia, 1,400 women to each 1,000 men, and in France and Belgium, respectively, 1,093 and 1,033 for each 1,000 men. The 1920 census reports for the United States show that there are 1,040 males to every 1,000 females in this country. The preponderance of women in foreign lands is believed to be partly explained by the death toll of numerous wars in the past few generations.



Long, Sharp-Toothed Saws Drawn by Horses or Propelled with Motors Cut the Ice into Narrow Strips after the Snow Has Been Scraped Away

Ice Still "Grown" on Ponds Is Now Harvested by Machines

Showing How the Planer Cuts Off Top or "Snow" Ice

HARVESTED with powerful motor or horse-drawn saws and packed by machinery in huge storehouses, some 24,000,000 tons of natural ice are cut each year in the United States for commercial purposes.

Little of this vast amount is seen in city delivery wagons, the clear, even cakes of the artificial product being preferred nearly everywhere, and it is estimated that more than 29,000,000 tons of manufactured ice were consumed last year, representing considerably more than half of the nation's ice bill of approximately two hundred and fifty million dollars.

But "putting up" ice from ponds, lakes, and rivers is still an important task to railroads that need thousands of tons in refrigerator cars, and to large wholesale companies. To take advantage of thick ice and to win out against the likelihood of sudden thaws, storms, and the shortage of the labor supply, machinery that saves time and work has been developed to a high degree.

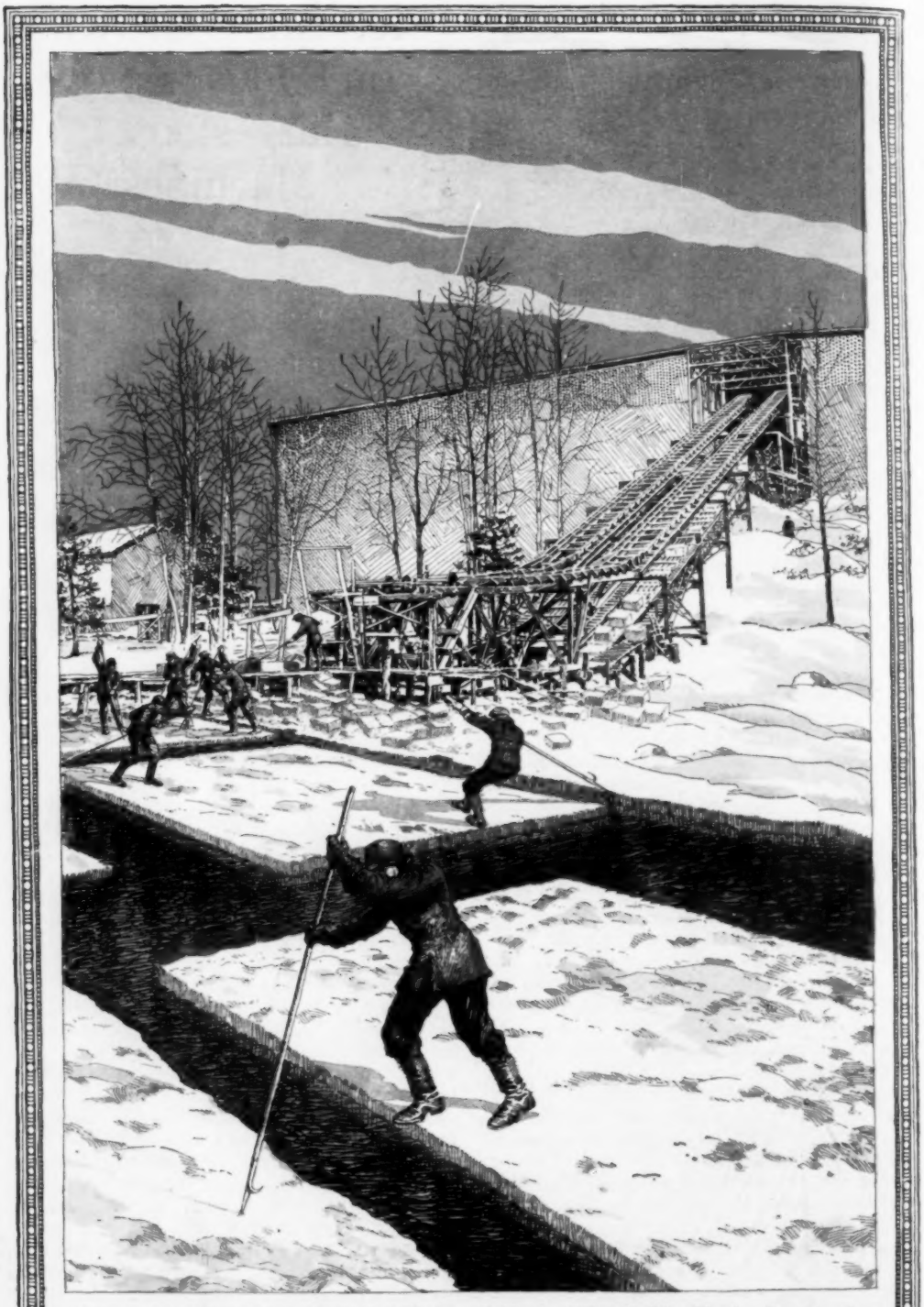
It is estimated that more than 40 per cent of the total natural-ice harvest is done with power apparatus, practically every field that produces 600 tons or more having motor saws and power-driven elevators to hoist the cakes to the storehouses.

As soon as the ice is thick enough to support the weight of men and scrapers, snow that may have fallen is removed. The ice is kept cleared after every storm so that it will "grow"—a protecting blanket of snow preventing it from reaching a desirable thickness.

The clearest, thickest, and best ice is near the center of the lake or pond where weeds have not accumulated and where the edges have not broken or rotted. A canal or sluiceway is cut out either with hand saws or with special machinery, the worthless ice being sunk or thrown aside. Then, with long, horse-drawn saws, or with rapidly moving motor-driven machines, the ice is cut into strips. In large fields, these are divided into 100-foot lengths and steered along the sluiceways by skilled men armed with pike poles who ride the "floats" in much the same way as loggers man huge saw logs in the forests.

A gang saw run on a shaft at the elevator cuts the floats into blocks of storage size. As the pieces are pulled out of the water and into the house on an endless-belt arrangement, a planer shaves off the surface or top ice and gives the cakes a corrugated top so they will not stick together and may be removed without breaking. This process also insures a level floor in the storerooms, an important factor in large houses.

Modern storage plants have insulated walls, floors, and ceilings and are designed on strict engineering principles. No sawdust is used between the cakes, as it has been found that this substance within eight or nine years, rots the walls of the house and makes it unfit for use. A light cover-



Armed with Sharp Pike Poles, Skilled Workers Guide the "Floats" Like Massive Logs to the Elevator Hoist where They Are Cut into Storage Blocks

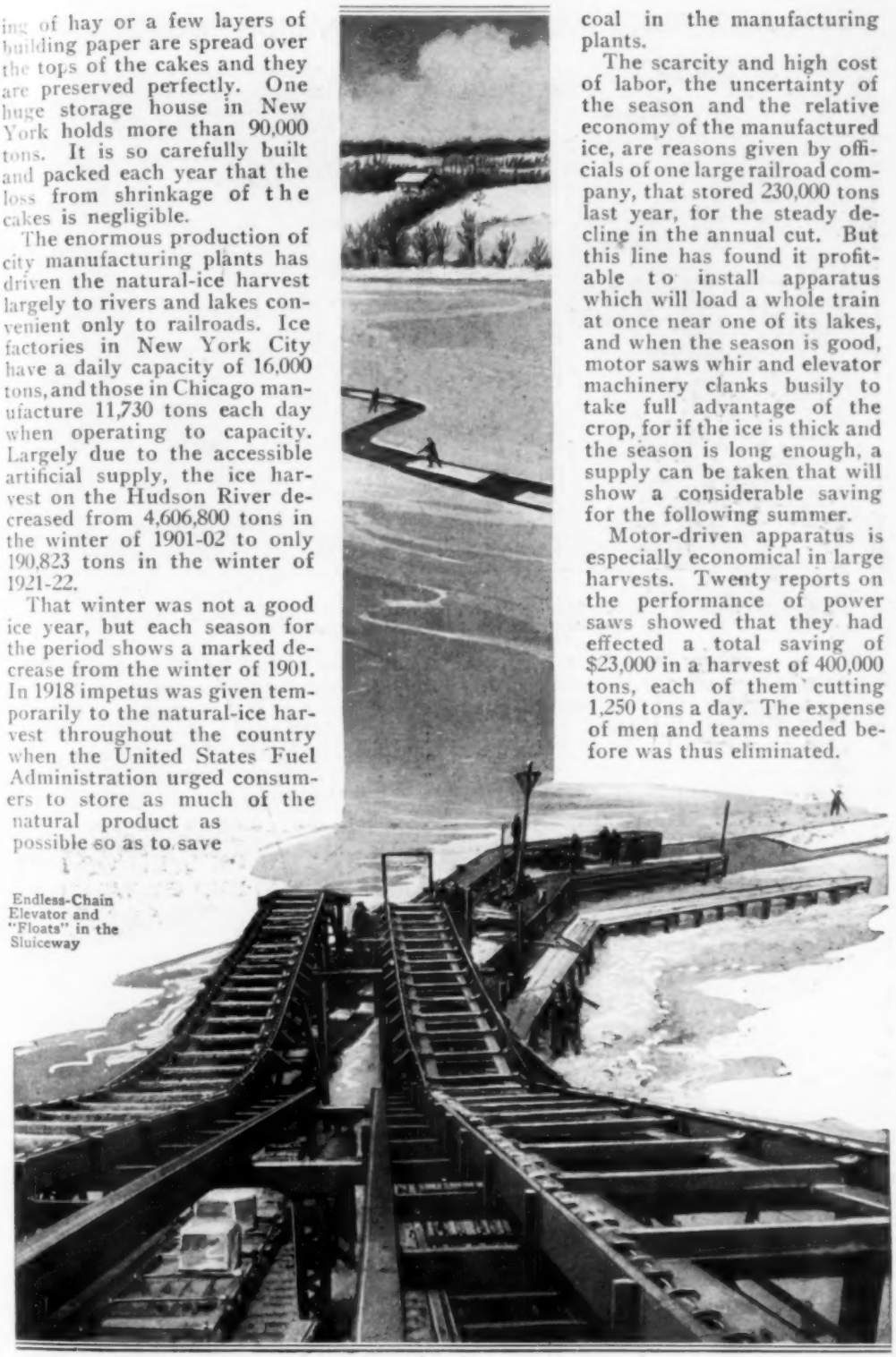
ing of hay or a few layers of building paper are spread over the tops of the cakes and they are preserved perfectly. One huge storage house in New York holds more than 90,000 tons. It is so carefully built and packed each year that the loss from shrinkage of the cakes is negligible.

The enormous production of city manufacturing plants has driven the natural-ice harvest largely to rivers and lakes convenient only to railroads. Ice factories in New York City have a daily capacity of 16,000 tons, and those in Chicago manufacture 11,730 tons each day when operating to capacity. Largely due to the accessible artificial supply, the ice harvest on the Hudson River decreased from 4,606,800 tons in the winter of 1901-02 to only 190,823 tons in the winter of 1921-22.

That winter was not a good ice year, but each season for the period shows a marked decrease from the winter of 1901. In 1918 impetus was given temporarily to the natural-ice harvest throughout the country when the United States Fuel Administration urged consumers to store as much of the natural product as possible so as to save coal in the manufacturing plants.

The scarcity and high cost of labor, the uncertainty of the season and the relative economy of the manufactured ice, are reasons given by officials of one large railroad company, that stored 230,000 tons last year, for the steady decline in the annual cut. But this line has found it profitable to install apparatus which will load a whole train at once near one of its lakes, and when the season is good, motor saws whir and elevator machinery clanks busily to take full advantage of the crop, for if the ice is thick and the season is long enough, a supply can be taken that will show a considerable saving for the following summer.

Motor-driven apparatus is especially economical in large harvests. Twenty reports on the performance of power saws showed that they had effected a total saving of $23,000 in a harvest of 400,000 tons, each of them cutting 1,250 tons a day. The expense of men and teams needed before was thus eliminated.



Endless-Chain Elevator and "Floats" in the Sluiceway

FISH ARE SENT IN CANS TO WAR ON MOSQUITOES

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Fish from Hatchery Being Placed in Cans Before Being Sent Out to Aid City's War on Mosquitoes; Oil from Portable Tanks also Was Sprayed Over Stagnant Waters

When mosquitoes recently menaced the health of a western city, the municipality started a hatchery where millions of small fish that feed on the pests' eggs were raised to combat them. As requests were received, cans of the fish were sent to residents who distributed them in ponds, ditches, and other breeding places. The number of mosquitoes was noticeably decreased as the fry, multiplying in great numbers, continued to devour the developing insects. Crude oil sprayed from portable tanks equipped with hand pumps was also used to spread a smothering film.

INVENTOR OF UMBRELLA RIBS REWARDED WITH FORTUNE

Although mystery shrouds the identity of the inventor of the umbrella, the man who devised the grooved rib and the paragon frame is known to have realized more than $2,500,000 from his idea. Ancient ruins of Assyria and Egypt display parasols in the sculptured stories of the life that has departed from them. It was then a badge of royalty, the nobility, or the priesthood, but was used as a sunshade rather than as the preserver of a dry skin. When the first umbrella appeared on the streets in England, it is recorded that its bearer, the brother of Robert Southey, the poet, was mobbed, and thereafter for some time any one carrying the "contraption" was chased off the streets.

¶Iron and steel rust causes damage estimated at $3,000,000,000 in the United States annually.

RUBBER TIPS ON STEM OF DIAL MEASURE SPEED OF WHEELS

Speed of machinery wheels and gears can be measured regardless of their shapes, by a meter that is equipped with interchangeable rubber tips that revolve when placed against moving surfaces. A hand on a figured dial shows the number of revolutions a minute. The instrument can also be used to gauge the speed of work being cut on a lathe and to measure the movement of belts, rope drives, and pulleys. All parts of the device are nickeled and it can be handled as easily as a watch.

TREE BEARING OIL FOR PAINTS TO GROW IN FLORIDA

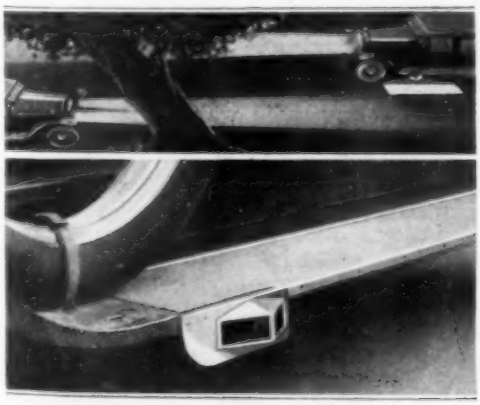
Tung oil, a product of nuts that grow on a tree native to China, and an important ingredient in the manufacture of paints and varnish, may be produced in the United States according to tests recently completed in Florida. A few of the plants, placed in the ground eleven years ago, have flourished to such an extent that it is believed large groves of them can be cultivated successfully.

DEMAND FOR ELECTRIC POWER HELPED BY WATERFALLS

Due to the rapid development of electricity for industrial and household service throughout the country, total sales of electrical energy in 1923 far surpassed those of any previous years, according to a bulletin recently issued. The report for the first six months of the year shows that 35 per cent of the output originated in plants operated by water, while steam furnished 65 per cent of the power.

AUTO SAFETY LIGHT RAYS GO TO FRONT, REAR, AND SIDE

Acting as a warning signal to the front, rear, and side, and as a guide to oncoming and overtaking motorists, a three-colored running-board light has been made. The white rays thrown directly on the road beside the car serve as a warning to passing motorists and prevent side-swipes on dark roads. At the same time, it shows



Automobile Running-Board Light that Gives Triple Warning to Passing Cars

green ahead and red to the rear, preventing crashes caused by failure of either of the head or tail lights.

"SKYSCRAPER" IS "BABEL TOWER" WHEN TRIED IN EUROPE

Corresponding in many details to an American "skyscraper," a 16-story office building with a restaurant on the top floor

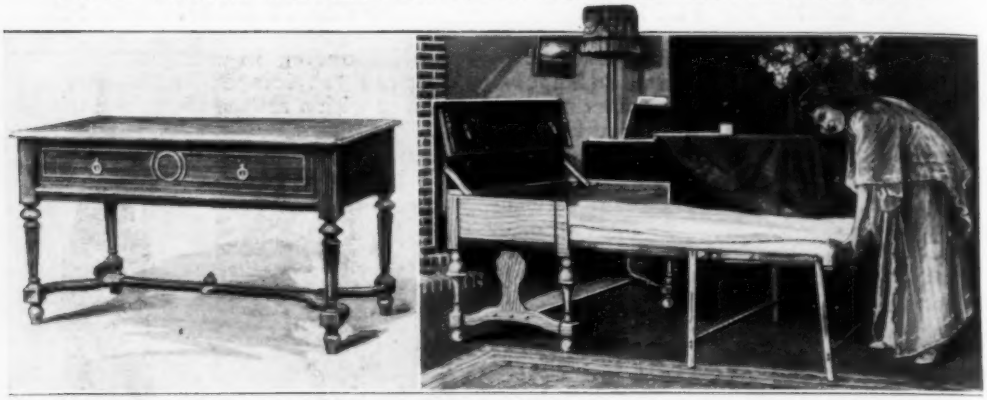
Sixteen-Story Office Building in Stockholm that Marks New Departure in European Construction

has been completed in Stockholm, Sweden. The edifice is said to be the highest modern business structure in Europe and may mark the beginning of a new construction era in cities where steel and other materials are available and where limited space makes this type of building practical. Residents of the Swedish city have nicknamed it the "Babel Tower."

WATER CURE IN FASHION TODAY KNOWN TO ROMANS OF OLD

Ruins of luxurious Roman baths and temples found near fashionable French resorts celebrated for their healing waters, indicate that the value of the springs was known in early times. In the Auvergne region, famous for its mineral wells, are remains of an artistic ancient building, and near by are broken stones of a splendid temple surmounted by a statue. With the fall of the Latin empire, many habits of cleanliness were forgotten, but since that time, careful study has been given the springs which contain various chemicals suited to the treatment of diseases. The places are visited annually by thousands of persons who partake of the healing water and enjoy the beauty of the surroundings.

BED THAT FOLDS INTO A TABLE SAVES SPACE



Mattress and Springs Concealed in the Drawer Space of Table when Bed Is Folded. The Top Tips Back to Form the Head of the Bed

Suited to small apartments, studios, and other rooms where space is limited, a combination bed and table is being made. Collapsible springs, a mattress and bedding fit into what is ordinarily the table-drawer space, and the top is lifted back to form the head of the bed. The springs, when extended, are four inches longer than the average, are comfortable, and are securely braced on stout steel legs. The article is manufactured in various finishes and styles to harmonize with other furniture. It requires no closet or wall space, costs little to install, and is quickly extended or folded.

AUTO TAIL LIGHT AND LICENSE COMBINED TO STOP THEFT

Combining the tail light with the license plate, a box arrangement which cannot be removed from the automobile has been perfected by an eastern inventor to prevent accidents and theft. The numbers serve as a door to the box which holds two strong lamps supplied with power from storage batteries. The numerals are visible for a block when the lights are lit behind them. The seal of the state and the make of the car are also carried so that theft of automobiles and shifting of plates are made increasingly difficult. The bright glow tends to lessen the likelihood of rear-end collisions at night.

Illuminated License Plate that Forms Door to Tail Light, Opened (above) and Closed

REFLECTOR FOR RADIO WAVES DIRECTS THEM LIKE LIGHT

By guiding radio waves with a screen reflector to prevent them from spreading in all directions, Sig. Marconi, inventor of wireless, hopes to confine messages to a limited zone, regardless of wave lengths, and thus reduce broadcasting costs. The Italian scientist is said to have developed an appliance to put back of the transmitter to keep the rays traveling within a narrow path. With this device, a message sent from London to New York might be heard only at stations near the receiving point, but would be kept from "listeners-in" in Spain or Sweden, for instance. The inventor believes that the reflector will decrease the amount of power now required for broadcasting. It also will prevent interference between different stations.

AMERICAN MACHINERY LEADS IN SOUTH AFRICA

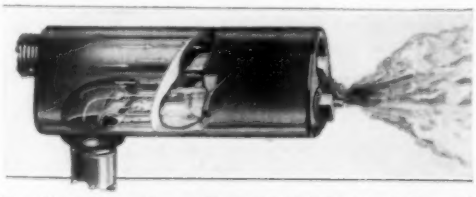
Writing from Elliot, South Africa, a correspondent declares that on his farm all the plows, harrows, corn planters, harvesting machines, "in fact everything but a cream separator" were made in the U. S. A., and the same can be said in the great majority of cases. In addition, he says 99 per cent of the tractors and automobiles throughout South Africa are imported from the United States. The reason is the low cost of the American product.

GREENBACKS DESIGNED TO FOIL "BILL-RAISING" FRAUDS

To make it more difficult to counterfeit paper money and to aid in quickly distinguishing various bills, uniform designs for all bank notes of the same value have been prepared by the government. Each denomination will be so distinctive that less confusion is expected in handling currency, and it will be almost impossible to "raise" a $1 bill to $10, or a $2 note to a "twenty," it is said. Old bills will be withdrawn as the new ones are distributed. At present there are 5 kinds of $1 bills, 7 different $5 notes, and 7 separate designs of the $10 notes and certificates.

MORE HEAT WITH LESS FUEL GIVEN BY OIL BURNER

Combining the fuel with an atomizer effect at the point of combustion, is the principle of a specially designed burner lately introduced. It is said to eliminate



The Illustration Shows How Oil Is Mixed and Sprayed at the Combustion Point

smoke and obtain the maximum heating efficiency in boilers that use oil. As the liquid reaches the firing point, it mingles and forms a fine spray with air, gas, or steam, which is forced by pressure through a pipe below the feed chamber. Because the mixture occurs outside the burner, an unlimited supply of oxygen aids complete combustion. Adjustments are provided to produce a long jet or a spreading flame.

CHURCH SPIRE CHOPPED DOWN AFTER IT DEFIES FLAMES

Church Steeple Felled Like a Tree after It Had Survived a Fire

After flames had failed to destroy a 200-foot church spire in the West, recently, wreckers chopped into the corner supports on the inner side to topple the spectral structure to the ground. A smaller steeple on the same site was pulled over with the aid of an auto truck. Flames, which destroyed the edifice, started halfway up in the larger tower, making a picturesque spectacle for the crowds that gathered that night.

¶Industries used 80 billion cubic feet of gas in 1922, or 25 per cent of the entire production of the United States. In 1910 less than 5 per cent of the yearly output was used for industrial heating.

False weights and measures often are employed by dishonest dealers to defraud their customers, the devices used defying detection through a casual inspection. In the case of the milk cans, shown in I, all of them are of the same external size, but the cutaway sections reveal double sides. Fraudulent weights have been attached to the scales (2). Dummy walls in the can (3) and buckets (4 and 6) were deliberately inserted to deceive the buyer. The bushel basket (5) also was arranged to cheat the unsuspecting public, the false sides and bottom cutting down its capacity at least a fourth. Although such devices are confiscated whenever found, and their users punished, nevertheless, the loss to the public is declared to run into the hundreds of thousands of dollars yearly.
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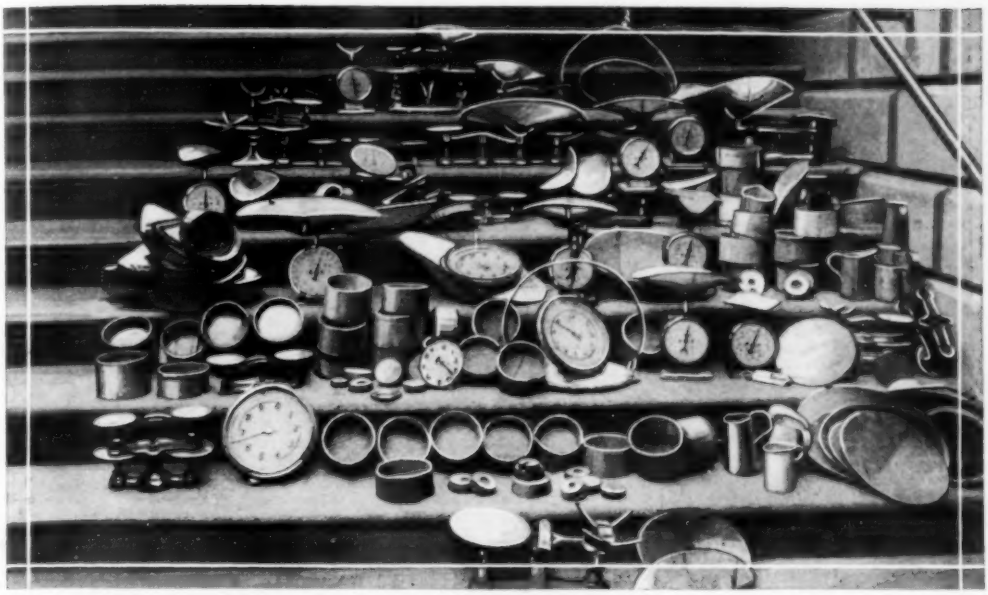
To Protect Buyers from Short Weights and Measures, Such as Are Shown Above, Most Cities Maintain a Force of Inspectors Who Seize and Destroy Fraudulent Devices



Confiscated Weights and Measures

Guarding the Nation from Weight Frauds

Army of Inspectors Constantly at Work Checking Standards, Save Public Untold Thousands of Dollars Every Day

UNTOLD thousands of dollars are saved the public every day of the year through the activity of city, state, and government officials who check weights and measures to guard against mistakes and deliberate frauds.

By promptly discovering a faulty butter measure before it had been widely used in Chicago, it was estimated that purchasers had profited to the extent of at least $750,000 a year. Detection of a false lard and meat scale was said to have kept approximately $350,000 in the pockets of buyers.

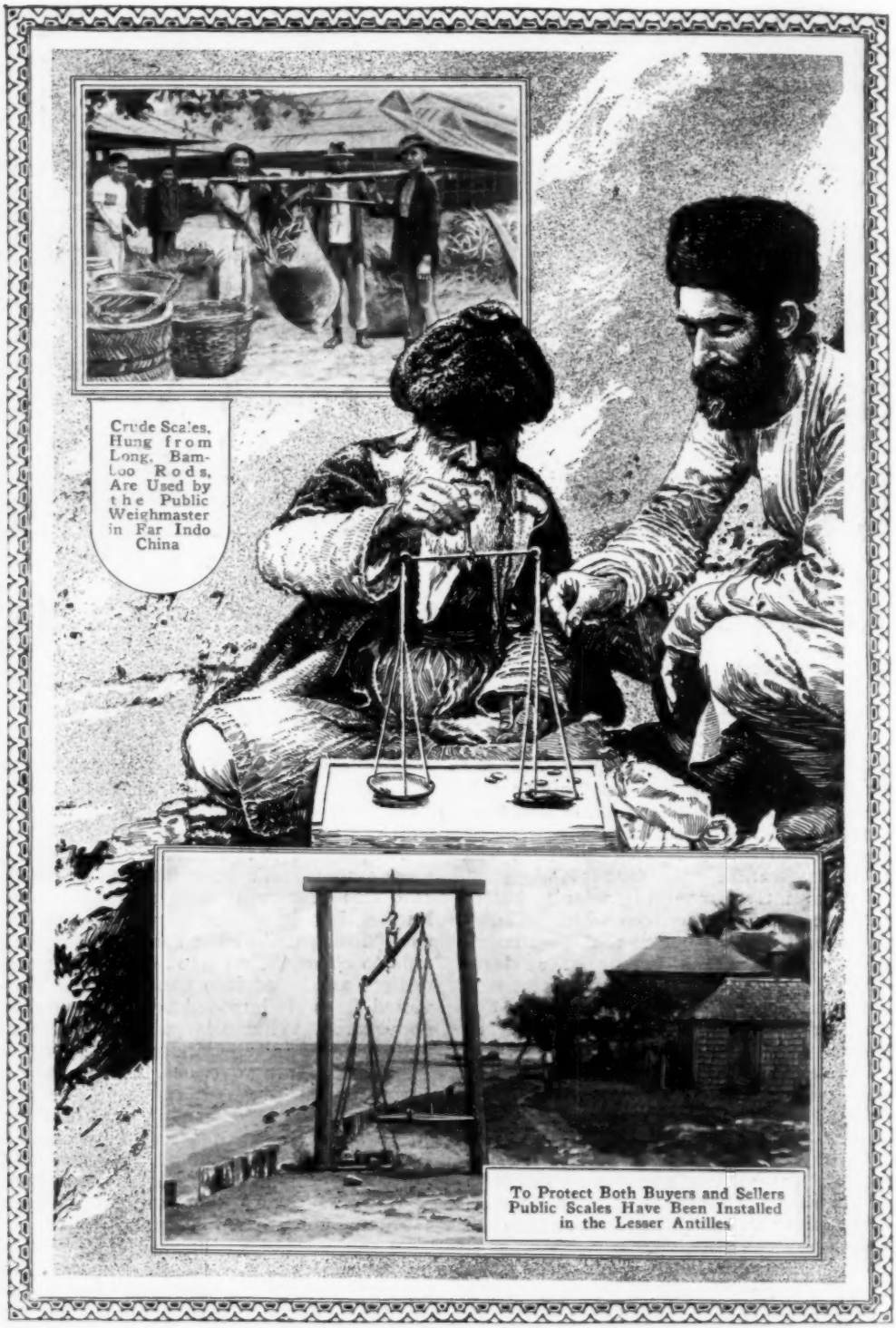
In one city alone, coal bills are cut several hundred thousand dollars a year through the constant checking of weighing devices, according to officials. Every scale of less than three tons capacity is inspected once a year, and stamped with an official seal of approval if it is correct. Those of more than three tons are checked twice a year.

To guard householders against the wiles of unscrupulous dealers who rest too heavy a hand on the meat scales, or resort to other means of giving short weight or small measure, is the task of an army of inspectors throughout the country. Every measuring machine, from a taxi meter to a candy scale, is checked. In many localities, the use of scoops and cups is prohibited and everything must be weighed.

Frequently, it is asserted, the trickiest storekeepers will have the most elaborate and reassuring weighing equipment known, but by clever movements or actual "doctoring" of the balances, they are able to cheat their customers. Dishonest dealers are haled into court, and, if convicted, fines are imposed and their weights confiscated. When a large assortment has collected, the false balances are destroyed.

As civilization advances, the task of insuring correct weights and measures has become harder. Measuring cups of some sort, and balances of design now considered obsolete, were employed ages ago, but the temptation was not so great then as values were not exact and had not been estimated with scientific precision.

In the Bureau of Standards, in Washington, a complete set of weights and measures is kept in sealed cases and under constant guard. These serve as models for the entire country. The weights are kept in air-tight cases to protect them from dust, and at a constant temperature.



Crude Scales, Hung from Long, Bamboo Rods, Are Used by the Public Weighmaster in Far Indo China

To Protect Both Buyers and Sellers Public Scales Have Been Installed in the Lesser Antilles

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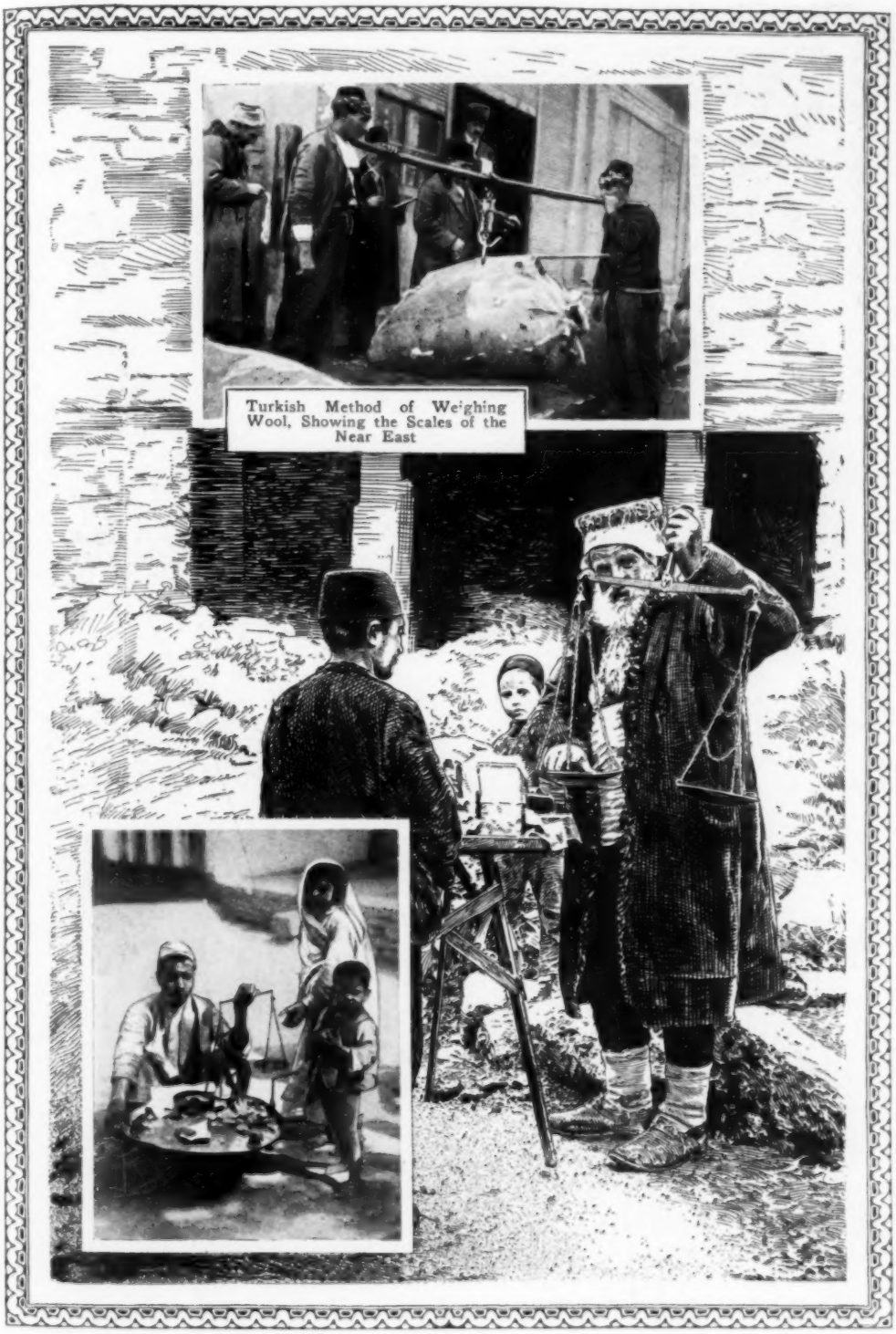
Even at the Outposts of Civilization, Scales Are Used, Although, As in the Case of the Persian Spice Seller Shown in the Center, They Are Primitive in Form



Turkish Method of Weighing Wool, Showing the Scales of the Near East

Turkish Candy Seller, with His Homemade Scales (Center), and, Below, an India Street Merchant Dealing Out Sweets by the Ounce with Round Pebbles as the Counterweights

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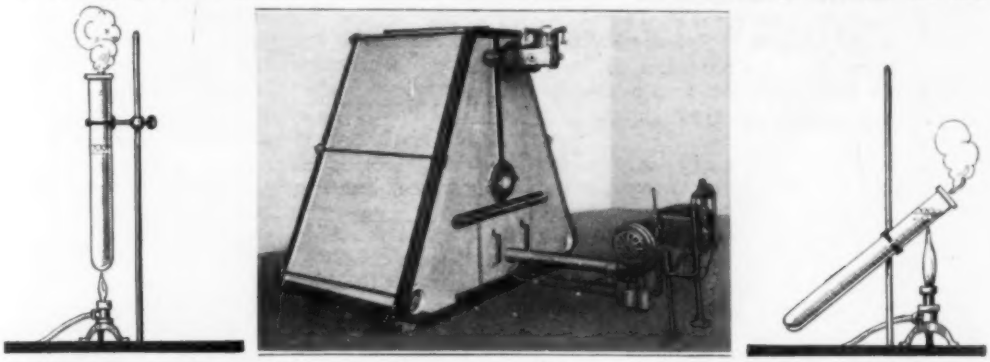
Curious Scales, Set upon Long Tripods, that Are Used for Weighing Hay for Shipment by Boat Along One of the Many Canals that Lower Transportation Costs in Holland

"UPSIDE-DOWN" BOILER SAVES HEAT AND FUEL

Heated at the top, where the smaller amount of water permits steam to be generated more quickly, a triangular-shaped boiler is now being used in plants where oil or gas is burned. Reversing the usual way of applying the heat from the bottom, it is unnecessary to bring all the water to the boiling point to get up steam, and so



Striking the Sloping Side of this Triangular-Shaped Boiler at the Apex, Flames from the Burner Quickly Generate Steam. The Old and New Principles Are Illustrated by the Drawings

efficient has this method proved that in a recent test it was found that 85 per cent of the heat was applied directly to the water, 10 per cent went to warm the basement, and only 5 per cent was lost in the chimney and in useless radiation. The boiler, generally, is said to be more efficient than the ordinary type. Flames from the oil or gas jet strike the apex of the triangle, made up of cast-iron sections of pipe resembling radiators, at the level of the top of the water, so that steam is generated before the lower part has reached the boiling point. The working principle of the boiler is well illustrated with a test tube. In an upright position, it is necessary to heat all the water in the tube before steam is made; with the tube tilted at an angle, the flame produces steam much more quickly, as only a small portion of the water has to be brought to the boiling point. As the boiler is heated, the cooler water flows back from the house pipes to the bottom, where it is warmed and rises to the surface.

BIRTHS OUTSTRIP DEATH RATE IN WORLD'S LARGE CITIES

Annual death rates in the twenty-six largest cities of the world are only about three-fifths of the birth rate, according to figures compiled by a French statistician. His reports show that for every 10,000 inhabitants, an average of 250 births and 154 deaths occurred in the large metropolitan centers for the year ended July 1, 1923. Alexandria and Cairo, Egypt, stood high on the birth and mortality lists with 576 and 530 births, respectively, and 259 and 282 deaths per 10,000 inhabitants. Bombay had the highest death rate.

TOOTH PASTE KEPT IN CABINET SUPPLIED BY TURN OF KEY

Tubes of toothpaste or shaving cream are held neatly and conveniently in a metal cabinet, within easy reach on the bathroom wall where their contents may be squeezed upon the brushes without waste or smearing, by a key tape fastened to the end of the container. The arrangement is adapted to tubes of various sizes and is attractively polished and easily cleansed.

As the Toothpaste Is Used, Tube Is Wound on Key in Cabinet

Mystery Mansion Found in "Spook Palace"

Maze of Halls and Stairways Uniting Rooms Built in Steps and Ornate Trappings Compose Wonders of Freak House

CONTAINING 144 known rooms and representing an estimated total cost of close to $5,000,000, "Spook Palace," a weird structure in California, is believed to be one of the largest, and probably the most complicated, private residences in the world.

Inspection of the marvelous house by experts after it had been thrown open for the benefit of the public recently, disclosed the fact that the builder sought to conceal as many rooms as possible from the eye of the ordinary observer. For instance, there are more than 2,000 doors in the building. About 10,000 windows requiring 150,000 panes of glass open out of the walls. Other materials used in its construction have been found to be the very best that could be procured.

According to reports, this sumptuous mansion was erected by a wealthy woman who gave little thought to expense in carrying out her ideas. She is said to have become possessed of the belief that when the building, which was her home, was completed, she would die. That was over 39 years ago. And until her death recently, the rasping of saws and the pounding of hammers had not ceased during that period of time.

Every working day for almost two score of years, a force of about a dozen artisans plied their trades in not only constructing new parts to the house, but in tearing out old sections as well, and rebuilding them in keeping with the wishes of the owner.

That the work might be delayed as much as possible, conspicuous portions of the structure, both outside and in, were left glaringly incomplete for several years at a time. All during its erection, the home was occupied, but few persons were ever permitted to enter its forbidden grounds.

Of the great number of rooms in the four stories which constitute the spook palace, but four or five are on the same floor levels, the variations being from six inches to several feet. This arrangement necessitates ascending and descending queer little stairways when passing through the house. They are composed of steps not more than two and a half inches high with treads of about 18 inches and built in narrow casings that are often less than a foot and a half wide. To attain a rise of eight and a half feet in one of these stairways, 45 steps are used and there are nine sharp turns winding crazily back and forth. Eighteen steps and five turns are required to reach a room four feet below the floor of another chamber.

There are so many intricate, winding, and bewildering corridors that a stranger passing through the building is in danger of becoming lost in their maze. For the benefit of the guides, arrows are painted on the floors pointing the way out. The puzzle is furthered by hundreds of balconies, large and small, which invariably open out from the wriggly stairs. These landings are usually found in pairs, but sometimes in larger groups. They were built by expert cabinet makers who used the finest of woods. The majority of

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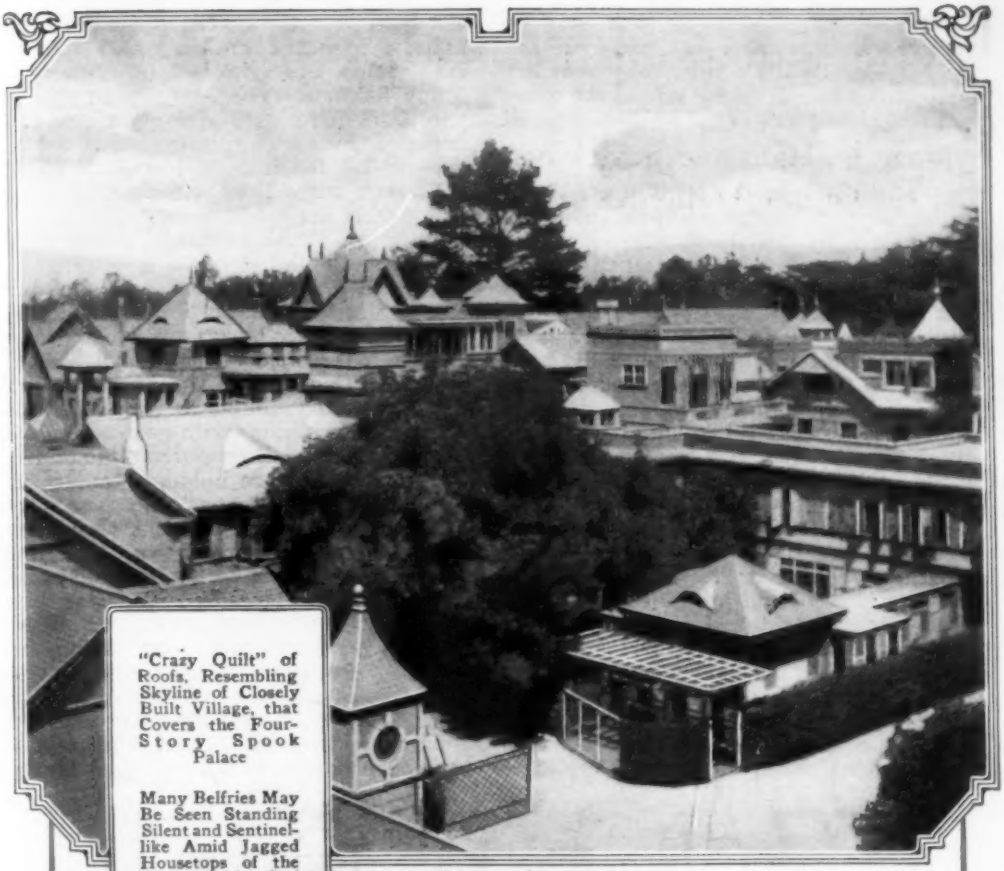
Doors to Rooms of Mystery



"Crazy Quilt" of Roofs, Resembling Skyline of Closely Built Village, that Covers the Four-Story Spook Palace

Many Belfries May Be Seen Standing Silent and Sentinel-like Amid Jagged Housetops of the Mystery Mansion

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them are in the centers of the rooms, on floor levels, in corners, and perched against blank walls. Invariably they are inclosed, so that climbing one of the crazy stairways is necessary to reach one of them.

Windows there are of all shapes and sizes and of the most exquisite glass. In walls, floors, chimneys, ceilings, and roofs they glisten by the thousands. And the same with the doors, which open inward and outward at the most unexpected places. Some cut in the upper stories open directly to the outside and mean a hard fall for the unwary visitor who should carelessly step through. Others lead to cupboards, closets, and innumerable nooks—sometimes so small that they will only admit a book. One door represents a gold-plated screen behind which is an elegant bird's-eye maple and art-glass panel. Back of that, is the wall, bare and unfinished, not even plastered.

Bathrooms number 25. In the center of one that is large and prominently located stands an old-fashioned zinc tub, but in the other 24 are modern fixtures, some silver-plated, and they have tiled floors and sides, decorated ceilings, and elaborate cut-glass windows. No attempt has evidently been made to connect any of the bathrooms with sleeping chambers, but they are scattered at random throughout the house. So with countless chests of drawers, which are visible and concealed. Many kitchens exist, shiny with marble, porcelain, and nickel equipment, and hundreds of sinks with running water are peculiarly located in out-of-the-way places.

Electric wires form a network so confusing that its solution has almost been abandoned. Push buttons dot the whole interior. Behind doors are large gongs connected with a myriad of wires that have not yet been traced, but these bells do not seem to be either burglar or fire alarms.

All rooms are gorgeously furnished in a wild assortment of things both ugly and beautiful, and as found with the rest of the equipment are hung with gold and silver-plated fixtures. Fireproof vaults and burglar-proof safes are hidden about to accommodate valuable trappings and silver service plate. A magnificent pipe organ stands in the main dining and ball room which measures 20 by 40 feet and is finished in delicately carved woodwork.

The main entrance, known as "Prism Hall" is 40 by 10 feet. Its ceilings are set with thousands of glass prisms that glitter in all colors of the rainbow. The front door, which is said to be worth as much as an ordinary house, is believed to have been opened only three times during

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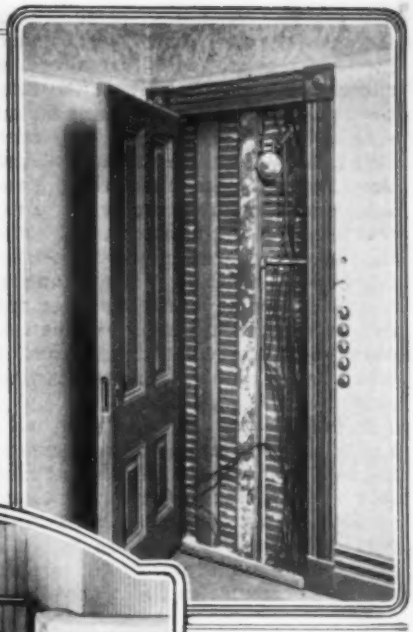
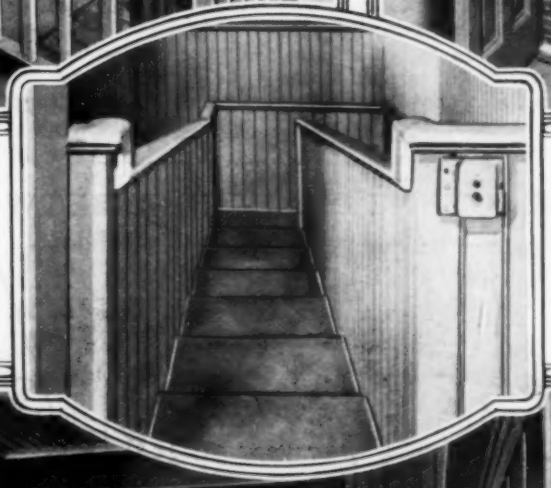
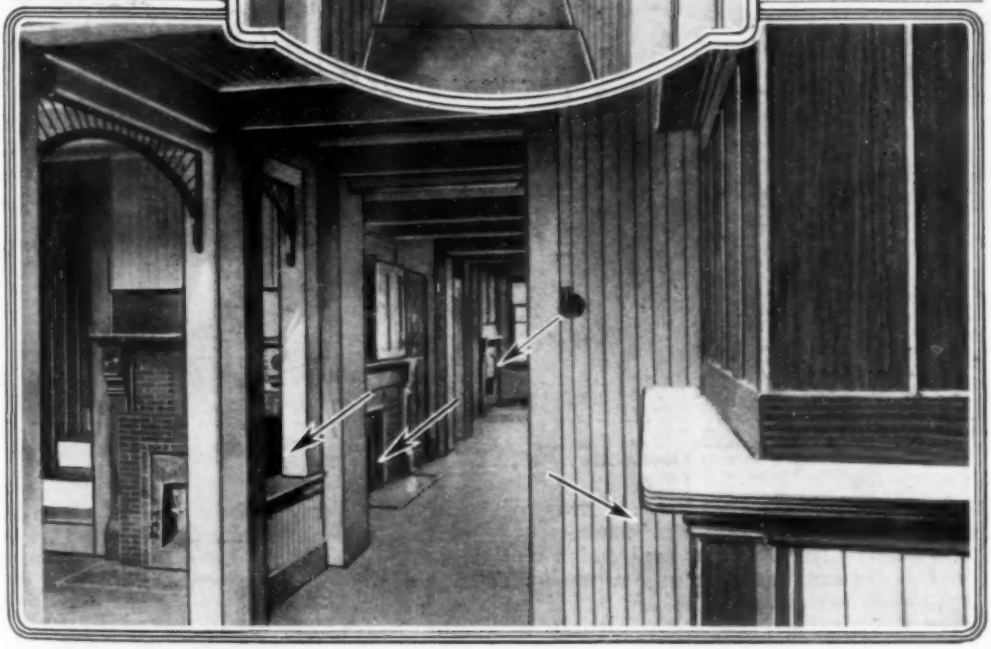
Many Conspicuous Parts of the Weird Structure Were Purposely Left Unfinished on Their Exteriors. View of "Prism Hall," Main Entrance to the Once Forbidden House of Secrets



Above: Twin Balconies Built on Level of Floor at the Heads of Two Stairways. They Are Made from Finest Hand-Polished Wood and Scores of Them Are Scattered at Random Throughout the Interior



Above: Gong Concealed Behind Richly Finished Door. Left: Stairway that Makes Nine Turns in Rise of a Few Feet. Below: Four Hearths and Five Radiators in Small Space. Arrows Point to Locations



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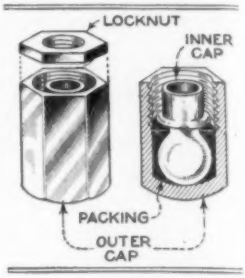
the owner's residence there. During all the years of occupancy with an extensive staff of servants and caretakers, none of these were ever permitted to enter more than five rooms of the mansion and, it is said, none ever saw more. The secret of the real reason for the existence of the house may never be learned, for the workmen knew nothing of its purpose. They were privileged to finish the exterior as they saw fit, just so long as it was in keeping with the general designs. They had to follow the one provision that the most conspicuous parts should not be completed on the outside. This resulted in rugged gaps in what were otherwise ornate walls surmounted by cupolas.

Formerly an eight-story bell tower reared above the labyrinth of roofs, but it toppled over shortly after being put up and was never replaced. After a generation of curious watching and speculation on the part of those living in the neighborhood, they have been allowed to enter the house of mystery and inspect its astounding interior.

AIR HELD PRISONER IN TIRE BY LEAKPROOF VALVE CAP

Held by a locknut to prevent its being jarred loose, a double cap for an automobile tire valve stem has been devised to prevent any leakage of air. It is made in three pieces, one of which fits down into the end of the valve stem and is kept in position by packing. In addition, there is an outer and inner cap. When these are screwed up tightly, it is impossible for the air to escape, according to users.



¶As many incandescent lights are used in the United States as in all other countries of the world put together, according to recent estimates.

DRILL FOR SOWING GRAIN RUNS BETWEEN ROWS

Tractor, Sower, and Cornstalk Turner Complete in One and Geared to an Automobile Motor for Planting Between Rows: Grain Is Carried in a Hopper

For sowing wheat between rows of standing corn, an Ohio farmer has invented a motor-driven tractor drill which will seed 25 per cent more acreage a day than a horse-drawn planter. Only 38 inches wide, the contrivance fits comfortably between the corn rows, which normally are 42 inches apart. While the grain is being sown, stalks that have been beaten down by rain or wind are lifted to vertical position again as the machine passes. The sower can be constructed at moderate cost and is a time and labor-saving addition to farm equipment.

LOFTY DAM BETWEEN CLIFFS TO FORM INLAND SEA

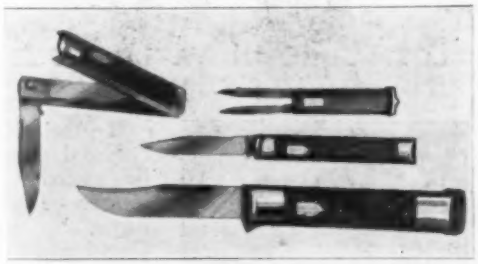
Rivaling nature's inland seas, a lake 36 miles long capable of developing 30,000 horsepower will be formed by a towering dam built between lofty cliffs of the Dix River gorge in Kentucky. Preliminary surveys for the water barrier were conducted for several years before the location was finally selected. When completed, the dam will be 270 feet high, and the estimated cost is 7,000,000 dollars.

DIVER IN CLUTCH OF OCTOPUS HAULED UP AND FREED

Attacked by a huge octopus while working on the wreck of a battleship at the bottom of the sea off the French coast, a diver nearly lost his life before his comrades could haul him up to free him. After a terrific struggle on the floor of the ocean, he succeeded in getting one arm free and plunged his trident into the monster's body. While he was being pulled to the surface, the ferocious fish held to him. It would not relinquish its prey until cut to pieces by the knives of his assistants after he was drawn from the water.

DETACHABLE BLADES ON PEN-KNIFE FOLD IN HANDLE

Having replaceable blades that fold compactly into the handle, when closed, a safety knife, which, it is said has many



Various Sizes of All-Metal Safety Knives with Detachable Blades Folded and Open

advantages over other styles, has been patented. A lock catch on the side releases and opens the hinged handle. The blade is pulled out for use, and when it is in line with the body of the tool, the handle is closed down over it, holding it rigidly in place. The article is manufactured in various styles and sizes, and is of nickel silver to prevent rust. It reduces liability of injury to the fingers and there are no sharp edges to tear the pocket.

SAFE TAKES DEPOSITS, STAMPS RECEIPT ON BANK BOOK

To collect industrial savings and do away with clerical work and bookkeeping, a recording safe has been constructed for use in business establishments. It accepts deposits

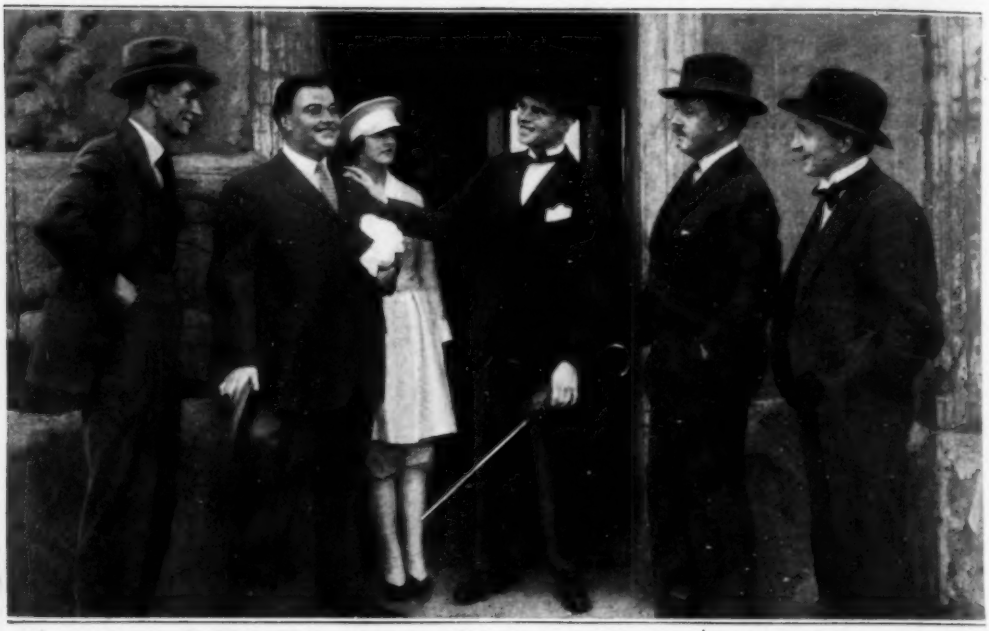
Automatic Teller that Identifies Savings Depositor, Accepts Money, and Issues a Stamped Receipt

of paper money, in denominations of from one to ten dollars, prints a receipt, and stamps the depositor's pass book. After the bank note is sealed in an envelope, it is inserted with the pass book into a folding metal frame, which is placed in the proper slot in the automatic teller. A lever is then pressed to carry the package into the vault. The device is said to encourage thrift among factory employes, because it conceals the state of their finances and eliminates the need of book work while paying in the installments.

HALF BILLION FEET OF SCREEN IN WAR AGAINST INSECTS

To combat flies, mosquitoes, and other insect pests, about 550,000,000 square feet of wire screen cloth are consumed annually in the United States, according to recent estimates. Rust, it has been found, is the greatest enemy to the life of the mesh woven from metals that can not resist the action of moisture. It has also been pointed out that more than 100,000,000 square feet of such screens must be discarded at the end of each season. During winter months manufacturers of the netting produce almost the entire supply for the following summer.

WAX MODELS SO REAL THEY DECEIVE THE EYE



Wax Models So Artistically Molded that It Is Difficult to Tell Them from the Living Figures: The Two at the Right and the One at the Left Are the Only Real Ones in the Group

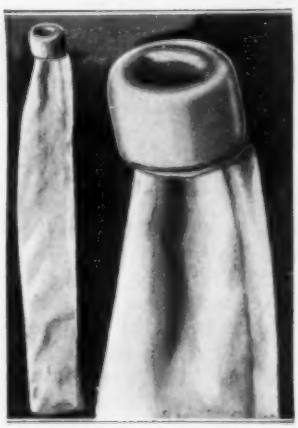
Working with wax, instead of with clay and marble, European artists have discovered a new industry in the making of models of men. These figures are said to be so realistic they deceive the eye and vie with the best product of the sculptor in naturalness of pose, fidelity to life, and correctness of detail. They are being introduced to replace the foppish masculine figures so often seen in men's clothing stores. These new models are not the pretty-faced kind with staring glass eyes, for their features are sculptured, even the wrinkles and muscular contours being exactly reproduced.

ALUMINUM COATED WITH GOLD TO RIVAL COSTLY METALS

By a secret patented process, aluminum is being plated with gold, silver, and other costly metals in Germany. No special treatment of the material is required before applying the coating, it is said, and the finished article is as attractive as wares made from the more expensive minerals. Objects thus prepared are reported to be especially useful for purposes of decoration, such as wall and ceiling ornaments and illuminating fixtures, where lightness is of advantage. It has also been found that aluminum covered with copper or brass can be manufactured into various products at a much lower cost than when solid brass is used.

¶San Domingo is the site chosen for the erection of an enormous lighthouse in memory of Christopher Columbus.

CLOTH TUBE ON WATER FAUCET ACTS AS SILENCER



Householders and invalids need no longer be annoyed by the sound of running water. A device consisting of a rubber socket and a cloth filter tube does away with the disturbance. The socket grips the faucet firmly and when the water is turned on it flows noiselessly into the basin or bathtub.

FIVE THOUSAND FED AT ONCE AT ELECTRIC BARBECUE

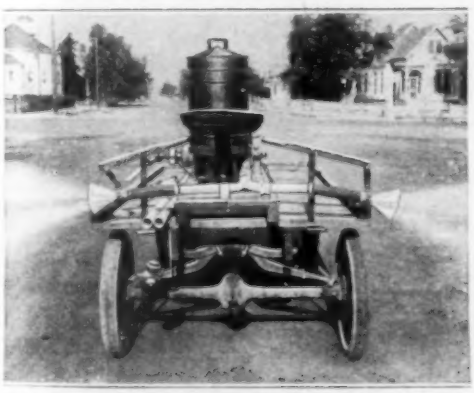
Four steers weighing about 2,000 pounds each were roasted in an electrically heated pit in the West recently, the meat being served to 5,000 persons. With the temperature automatically controlled, it required 24 hours to cook the beef thoroughly. The improvised oven was 32 feet long, 4 feet wide and 6 feet deep.

CAMERA TO DETECT FORGERY SNAPS FACE AND NAME

Simultaneously photographing the depositor and his signature, a double camera arrangement has been perfected by an eastern inventor for use in banks and business houses to detect forgeries. Upon a special plate the machine at one "snap" registers a picture of the person and of his handwriting, which is affixed to a blank and kept with the photograph for reference in case dispute later arises as to the depositor's identity or his signature.

GRAPES ARE SAVED BY SPRAY OF WET OR DRY SULPHUR

For spraying grapes to prevent mildew, a California vineyardist has invented a device which spreads a fine coating of wet or dry sulphur over the vines. Mounted on a wagon, the apparatus is driven between



This Sprayer Dusts the Vines with Wet or Dry Sulphur to Prevent Mildew

the rows. A blower run by a small gas engine distributes the powder from adjustable nozzles on each side. A rotating disk in the bottom of the hopper regulates the quantity of the material used per acre and mixes it thoroughly so that when moist it will not clog the pipes.

COIN-IN-THE-SLOT "BOOTBLACK" SHINES TAN OR BLACK SHOES

Only 40 seconds are required to polish a shoe by a recently patented machine that is set in operation by the insertion of a coin in a slot. The automatic "boot-

Coin-In-Slot Shoe-Shining Machine that Can Polish Either Tan or Black Footgear

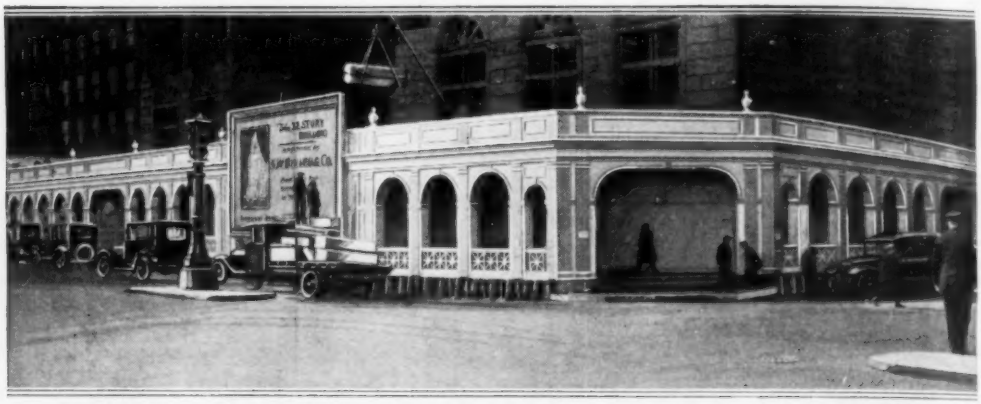
black" applies dressing, brushes the footgear, and polishes with a cloth. One side of the device is for tan shoes and the other for black. A lever, which the patron pushes into labeled notches, adjusts the mechanism for the desired color. A cent must be inserted before each shoe is shined.

TEST FOR OPTICAL ILLUSIONS PLANNED FOR STUDENTS

When two trains are standing at a platform and one starts, why is it difficult for those in the other to tell which is in motion without looking at some stationary object in the same line of vision? Why does the moon seem to race across the heavens on a partly cloudy night and the clouds stand still? Why is a person sitting in the dark unable to determine which of two lights is in motion and which is stationary? Exhaustive tests to determine the causes underlying optical illusions, such as those described above, are planned, more than three hundred students of psychology being used in the experiments which are expected to be of value because of the light they are expected to shed on human nature.

¶To make it fit the height of any-age child, an eastern man has designed a seesaw that can be raised or lowered.

ARCH SIDEWALK BARRICADE IS ORNAMENTAL

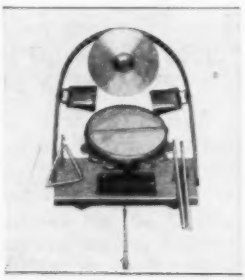


Beauty and Usefulness Combined in Protective Barricade Over Sidewalk to Provide a Covered Passageway while Chicago Skyscraper Was Being Erected

In place of the usual rough and unfinished barricade erected to protect pedestrians passing buildings in the course of construction, a firm of architects in a western city has designed a covered passageway that is attractive as well as serviceable. It surrounds one of the city's new skyscrapers. A series of graceful arches give it the appearance of a permanent structure.

ONE-MAN ORCHESTRA IN HOME USED FOR ACCOMPANIMENTS

Accompaniments to phonograph, piano, or radio selections may be supplied in the home on a set of drummer's traps rigged to an adjustable tripod stand. The outfit consists of a tambourine, wood drum, triangle, cymbal, two cow-bells and sticks and fits into a small case for carrying. The instruments are of a size especially designed for parlor use or in connection with dances in the home.



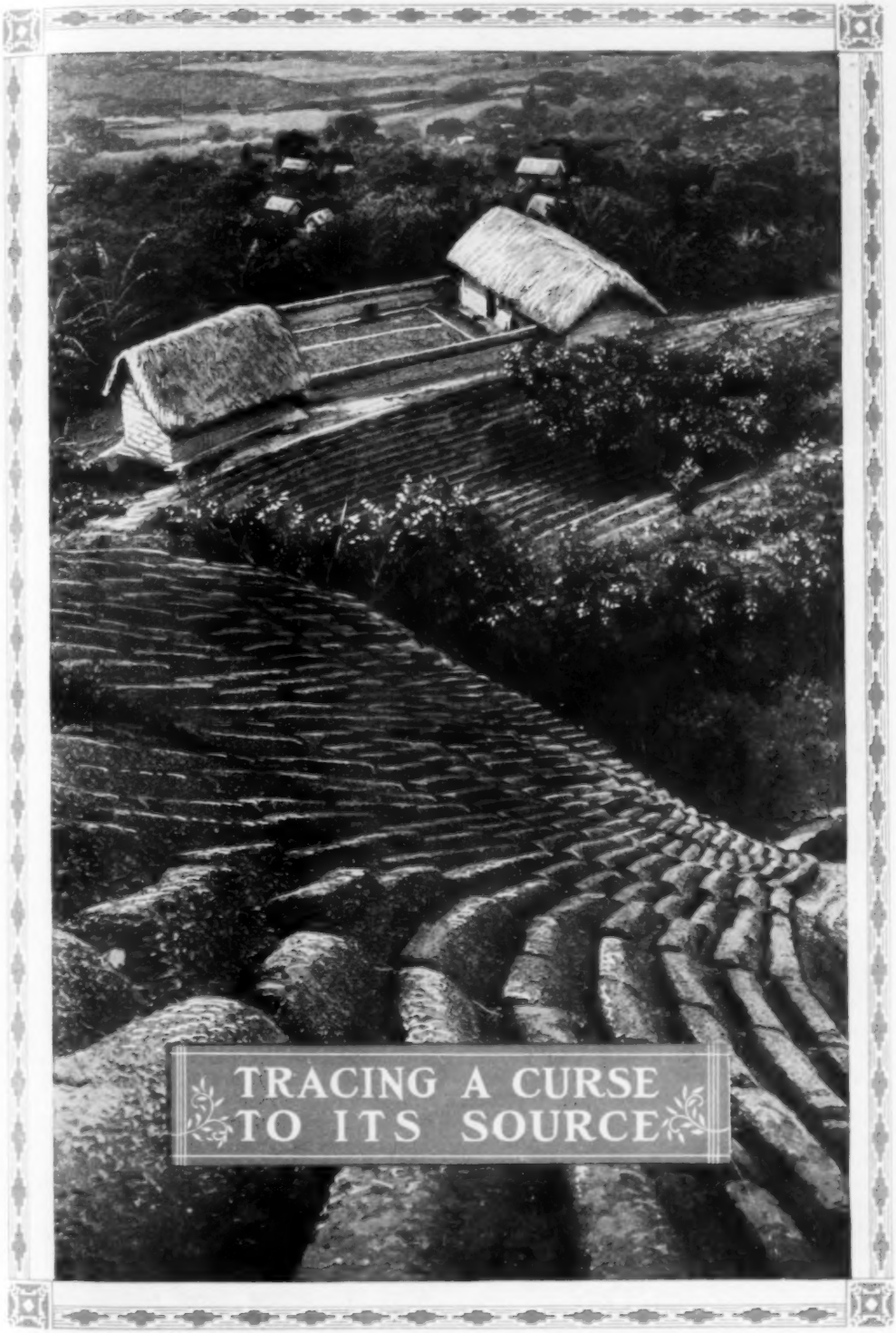
"CRIERS'" BELLS RING AGAIN IN THE RHINELAND

Town "criers" are again exercising their calling in the Rhineland. Newspapers rarely penetrate into the hamlets in the mountain districts along the Moselle, and the separatists have therefore pressed into service these survivals of feudalism. Once again they walk the streets, ringing their ancient bells to attract the attention of the public and reading aloud the news, and the proclamations and orders of the authorities at Coblenz.

SIGNAL LAMP AT GAS STATION SHOWS AMOUNT OF BILL

For convenience of motorists at filling stations, large signal lamps lighted at night and which can be seen from almost any angle, show the charge for a gallon of gasoline and the cost of the amount purchased. Connected to tops of the pumps, they have figures large enough to be read easily by persons seated below them in automobiles. Turning of a key changes the price for a gallon, and automatically adjusts a set of total amounts for various quantities printed on a vertical scale.

¶Eight thousand American buffalo were rounded up in Canada recently to make "atmosphere" for a moving picture.



Terraced Mountain Side where Coca-Plant Slips Are Grown During Their First Year

In the Coca Fields, Gathering the Drug Leaves which Are Packed to the Seacoast Cities for Export Abroad or Sent into Native Districts and Sold Among the Indians

Drug Curse Is Pall on Roof of World

Chewing Coca Leaf Is Almost Religiously Practiced by Andean Indians Who Live Under Its Spell

WITH the growing use of habit-forming drugs among the western nations, educational work is being directed toward the sources of supply of one of the most noxious of these—cocaine. Among its addicts it is better known as "snow," and some authorities hold it to be the curse of the Occident.

The principal sources of coca, from which cocaine is derived, are the Andean sections of Peru, Chile, Bolivia, and the Argentine. In the districts lying along the upper reaches of the Amazon River, the growing of coca leaves is as common as the cultivation of tobacco is in the United States. The province of Yunga, Bolivia, is the chief producing territory, the output aggregating more than 40,000,000 pounds annually. The production is constantly increasing, and it is believed that the total crop of the South American countries for the past year exceeds 75,000,000 pounds. More than three-fourths of this amount is consumed by the native Indian population.

An Andean Indian will bear up with stoic indifference while misfortune and disaster strip him of his most meager possessions, but never does he permit his supply of coca leaves to become exhausted. He will go to almost any length to prevent such a "calamity." The taking of their coca with the rising of the sun has become an almost religiously followed practice among these people up on the roof of the world of the southern continent. The firmness with which the coca-chewing habit has practically an entire race in its grip is indicated by the ceremonial activities associated with its use. When the native laborer comes to his work in the morning, it is always at least a quarter of an hour before he is expected to begin his tasks. He picks out a spot upon which the rays of the sun will strike, and squatting on the ground, faces eastward. As the first bright gleams of light burst over the horizon, he extracts his coca pouch from beneath his belt and begins to stow the leaves, one at a time, into the recesses of his left cheek, crowding them in until the side of his face bulges.

About ten o'clock in the morning, the Indian worker generally finds that his supply of coca leaves is losing its strength. At this time he takes a respite from labor to replenish the quid. Then for a period of fifteen minutes the solemn ceremony of the early morning is repeated. Even the North American firms who employ the Indians throughout these regions find it necessary to grant them morning and afternoon recesses in order to renew their supplies of coca. Failure on the part of

the employer to permit this would furnish immediate cause for desertion by his laborers. The use of the drug is not confined entirely to the men. Wherever a number of women are gathered, in the harvest fields or gossiping in groups about their rude dwellings, they crowd together in a circle at regular intervals, and chatting all the while go through the strange ceremony of feeding the coca leaves into their mouths. Always it is done with the slow, monotonous, leaf-at-a-time motion. They never hurry in this performance.

The raising of coca plants is almost entirely limited to the eastern slopes of the mountains and has come to monopolize vast areas to such an extent that, although the soil and climate are admirably suited to the varied crops, even vegetables which are needed for the food supply are transported on muleback hundreds of miles over the rugged territory.

Among the Indian Laborers, the Continual Wadding of the Cheeks with Coca Leaves Causes Distortion of the Face

The coca plant is shrublike and its small green leaves are stripped from the stalk three or four times a year. The seedlings are started in protected beds and when about one year old are transplanted to troughlike terraces for cultivation. The country everywhere is steep and rugged, so terraces must be constructed on the sidehills to hold back a part of the dashing mountain rain. About two years after being placed in the terraced fields, the first crop of leaves is gathered. These are dried on flagstones in the open air. After thorough curing they are baled in huge primitive presses, banana leaves and burlap being used for covering, and transported by muleback to the seacoast cities from which they are shipped to other parts of South America to be sold among the Indians or to the United States and Europe, where the drug, cocaine, is extracted.

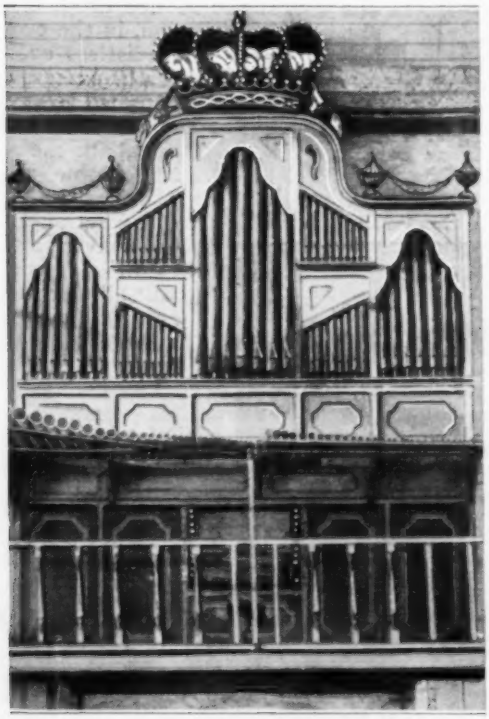
Because of the bulky proportions of the quid of coca leaves, the cheek of the Andean Indian given to the practice of chewing them assumes a permanent appearance of being swollen. But the effects of continued use of the drug are more deep-seated than this, say observers. While the chewing of the leaf is a habit far less harmful than the use of the refined drug, because of the slow assimilation, in the end the result is the same. The listless eyes and general appearance of stupor common to the natives who are accustomed to the narcotic, plainly mark them as a race of unhappy drug victims. Physical and mental destruction are the unavoidable results of years of addiction to the leaves, authorities agree. But all this the Indian ignores. The quid of coca leaves is his strength and his solace. Under its influence the rugged hills of the Andes are smoothed to his tired feet and the biting winds feel soft and pleasant to his sun-beaten cheek. His body-wracking tasks are lightened and his means of existence become bearable as long as he has access to the leaf which gives him solace and rest.

Travelers who have penetrated to the mountainous fastness of the Andes, report having seen bands of workers, often numbering more than a score, squatting grotesquely on a wind-swept mountain side, solemnly stoking coca leaves into their cheeks and awaiting the reaction of the crude drug they contain. When the influence of the drug has taken effect they resume their tasks until its powers wear out.

With a system of education that will appeal to the worker, it is hoped by those interested in the movement to reduce production of the drug, not only to suppress the general sale of the leaves but to substitute other crops that are more needed by the thousands of languid, and often totally ignorant, natives, who live under the evil spell of the "snow" curse.

CENTURY OF MUSIC SUPPLIED BY BAMBOO ORGAN PIPES

Constructed of 120 pipes of native bamboo, an organ in the Philippine Islands has furnished music for more than 100



Bamboo Pipe Organ Played in Philippine Island Church for More than a Century

years. The hollow reeds, of various heights and diameters to produce the proper pitch, had been so thoroughly dried, polished and seasoned in the making of the instrument that they have not been damaged by the tropical climate and have resisted the ravages of wood-devouring insects. The organ is said to have a mellow tone of pleasing quality.

SOFT-COAL SMOKE COSTS CITY MILLIONS EVERY YEAR

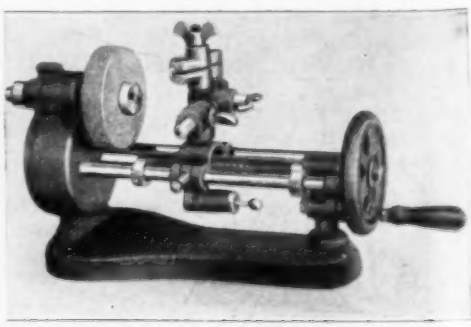
Smoke clouds pouring from Chicago's locomotives, its 300,000 flats and large apartment buildings, and its 20,000 industrial chimneys, as the annual coal pile of 30,000,000 tons is consumed, has grown greater in recent years. It is estimated that the damage done by smoke to fabrics and the added cost of laundering amount approximately to $8 per capita, and the loss in fuel, due to improper stoking and poorly constructed furnaces, is placed at $7,500,000 each year. More than 43 per cent of the smoke comes from the 1,800 locomotives in daily service within the city, according to official investigation, so that the contemplated electrification of the railway lines, when completed, will reduce the smoke nuisance nearly one-half.

AIR SPEED-RECORD LIMIT OFFICIALLY FIXED

Believing that the maximum speed in the air which is possible without grave risk to human life has been attained, officials of the bureau of naval aeronautics have prohibited, for the time being, further official contests between fliers, it was announced recently. The action was taken after an aviator had two narrow escapes from death while shattering a world's record at an eastern field recently. An average of 266.6 miles an hour was maintained by one flier over a 3-kilometer course, and another reached the highest speed ever attained by man, doing part of the distance at the rate of 274.2 miles an hour.

WHEEL ON SHEAR SHARPENER MOVES VISE, TURNS STONE

By the turning of a handwheel on a shear sharpener recently put on the market, scissors placed on the machine for dressing are passed over a revolving grindstone while held by a moving vise. Any bevel desired may be produced on the cutting edges by adjusting a set screw. The sharpener is strongly built and is of



Scissor Sharpener with Vise and Handwheel that Moves Tool across Revolving Grindstone

special advantage to cloth cutters and barbers. It is said to give a perfectly even edge to the tool and to have no delicate parts.

BURGLAR INSURANCE RATE CUT BY DOG AS A WATCHMAN

Lower burglar insurance rates for persons keeping a dog, have been announced by one company. It does not matter whether it is a toy poodle, a ferocious English bull, or just a plain yellow cur. This is said to be the first recognition of the kind of the efficiency of animals as guardians of property.

AMOUNT OF LUMBER IN TREE IS MEASURED BEFORE FELLING

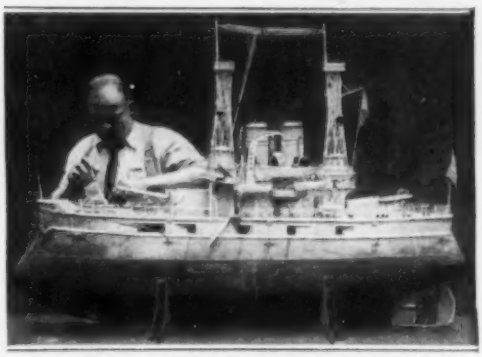
While a tree still stands in its forest home the number of board feet of lumber it contains can be measured with a fair degree of accuracy by an instrument recently

Accurate Tripod Scale for Measuring Board Feet of Lumber Before the Tree Is Felled

patented. A great saving of time results, as well as a reduction in the number of workers required to survey a timber tract since one man can rapidly and accurately perform work formerly requiring the services of twelve.

SIX-FOOT WARSHIP HAS GUNS, RADIO AND ENGINES

Complete from wireless aerials to keel, a miniature battleship has been con-

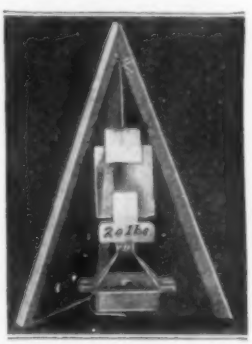


Model Battleship that Can Fire Broadside in Any Direction and Has Radio Equipment

structed by an inventor in New Jersey. The vessel weighs 500 pounds, is 5 feet 9 inches in length, and can float and fight. Operated by a series of levers, the craft can be set to start or stop at any time, and the guns can be adjusted to fire in any direction. The ordnance equipment consists of five pieces to each broadside, one machine gun and two anti-aircraft howitzers giving the ship a firing capacity of 120 shots per minute.

PASTE FOR MANY USES STICKS LIKE CEMENT OR GLUE

Adhesive qualities of the strongest glue, cement, or mucilage, are said to be combined in a transparent paste being manufactured by a western man. It will securely bind together a wide variety of materials such as glass or stone to wood, the maker asserts, but will not stick to the fingers. It is contained in a tube, and because of its transparency is especially adapted for pasting together torn book or newspaper pages. It will hold firmly to varnished woods or polished metals, leather, and various fabrics, it is claimed, and dries quickly. It is said also to contain medicinal ingredients beneficial to the skin.



RAISED CHAIR FOR CHILDREN FITS THEATER SEATS

Shaped to fit snugly into a theater chair, a raised seat for children has been constructed, enabling the child to look at the

From this Seat Placed in the Theater Chair Children Can See the Show

performance without standing up or climbing upon its mother's lap. The front side of the lower frame is extended so that it provides a foot rest, and the top is wide enough to allow the small occupant to curl up when reclining. The contrivance is easily adjusted or removed by an usher and does not mar the theater seat.

AUTO INVENTORS' TESTS KEEP GOVERNMENT EXPERTS BUSY

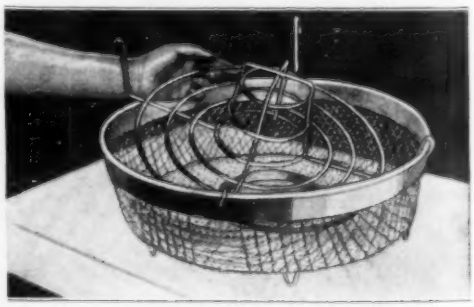
Hidden away from the owners of automobiles, there are thousands of men who are working for them—seeking to make their cars give more miles per gallon, to take the bumps out of the road, to make tires wear longer, and to improve the motors. The inventors' efforts keep a staff of government testers busy. First, probably, the device is tried out on a neighbor's car. Then a model is shipped to the staff of engineers in Washington, who read the careful instructions sent by the inventor and put it through its paces. "Gas savers," carbon removers, shock absorbers are received by the score. During the war, enemy aviators learned the trick of shooting holes in airplane gasoline tanks. An inventor got the idea that the fires and kindred disastrous results could be prevented by solidifying the fuel. His plan was to introduce albumin into the fuel and subject it to a whipping process, as the housewife whips cream. The fuel was prepared and the scheme tested. The engine ran for a few minutes, gasped, choked, and stalled. It refused to start again. Upon being dismantled, it was found to have foundered upon fried eggs. The heat of the motor had coagulated the albuminous substance which the inventor had brought with him and proved, without further chemical analysis, that it was indeed the white of eggs.

CANADA'S FOREST ACRES GROW HALF OF BRITISH TIMBER

Representing approximately one-half of the timber resources of the British Empire, the Canadian forests supply lumber, wood pulp, news-print and other kinds of paper to all parts of the world. At a recent forestry conference in Canada, it was stated that there are about 500,000,000 acres of forest land in the Dominion, many parts of which have not yet been touched by commercial exploitation. The value of the annual timber production is placed at $600,000,000.

DISH DRAINER IS REMOVABLE TO MAKE CLEANING EASY

Equipped with a plate rack and a cutlery holder, both of which can be removed from the round frame of wire mesh, a newly invented dish drainer is recom-



Dish Drainer that Can Be Easily Taken Apart After Using and Readily Cleansed

mended as being more easily cleansed than the older designs. It is made of aluminum, is light and compact, and has no rough wire ends to injure the hands.

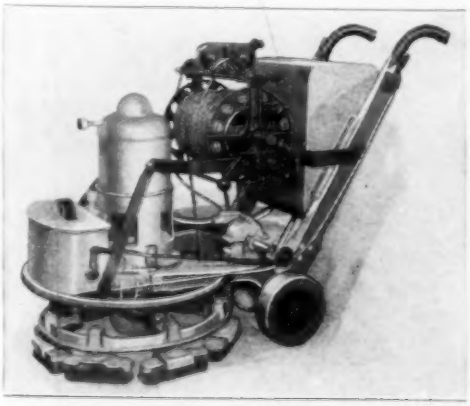
¶Recent soundings place the greatest depth of the Mediterranean at 14,436 feet.

NIGHT SCENES FOR MOVIES TAKEN IN SUNLIGHT

Trick motion-picture photography has received an aid in a "panchromatic filter," recently perfected in California. The new invention consists of a series of glass filters which reverse the rays as they enter the camera and break up the light, similar to the action of a prism. When the screen is applied, strange effects take place. Sunshine is changed on the film into moonlight; red, which usually photographs black, comes out as white, and blue tends toward black. The sky takes on dark shadows without distortion of objects in the foreground, thus producing an appearance of moonlight.

MOTOR SCRUBBRUSH SAVES TIME AND LABOR

Designed for scrubbing the floors of large offices and halls, a self-propelled machine has been invented which is said to do the work of ten men. A row of brushes attached to a revolving frame whirls at high speed over the floor surface as the apparatus, running on two wheels geared to an inclosed electric motor, advances. Water and powdered soap, held in containers on the frame, are distributed in the path of the brushes as they rotate.



Electric Scrubbing Machine with Brushes, Soap, and Water Tanks for Scouring Floors

Power is supplied through a small cable which may be attached into a wall or lamp socket. It winds on a revolving drum as the machine moves. A path thirty inches wide is scoured at a speed of about 150 feet a minute. One man is required to operate it and another follows to mop up. The wheels have broad rubber tires to protect polished floors.

FOUR HANDS NEEDED TO GUIDE MONSTER FOUNTAIN PEN

Complete in every detail and carefully fashioned after one of ordinary size, an

Writing Invitations with Fountain Pen so Large that It Took Four Hands to Guide It

enormous fountain pen was used to write public invitations to an eastern advertising show recently. Two young women were required to guide the utensil, which later was displayed as the central figure in one of the exhibits. The mechanism and the ornamental designs on the barrel were accurately modeled.

SHIP A DAY IS WRECK TOLL FOR THE PAST YEAR

Sea craft including 350 steamships and 144 sailing vessels were lost last year, not counting those under 100 tons burden, according to official information. Thirty-four were abandoned at sea; 105 foundered; 43 were posted as missing; 55 were burned; collisions accounted for 25; 214 were wrecked, and 18 were destroyed in various ways. This includes ships of all nations. In British shipping alone, more than 1,000 sailors and fishermen are lost every year, and several thousands are injured. In spite of all improvements in construction and navigation, seafaring remains one of the dangerous callings.

¶Bubonic plague killed off one-fourth of the world's population in 1348.

Photo Courtesy American Lumberman

Area of Land Ravaged Yearly by Forest Fires Could be Represented by a Strip of Ground One Mile Wide and Extending from Chicago to Atlanta, Georgia

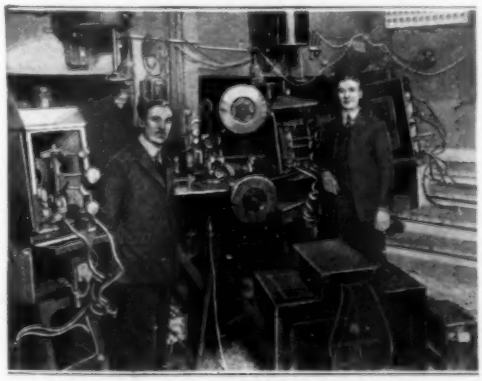
NATION'S MOUNTING FIRE LOSS CUT BY SAFETY MEASURES

With the nation's fire loss for 1921, as shown by insurance-company reports, placed at $495,406,012—a sum equal to more than half the annual interest on the public debt of the United States, enough to run the navy and the legislative departments of the government for twelve months, or nearly twice the amount disbursed in pensions that year—the importance of safety measures and devices for putting out fires before they have gained a dangerous headway is growing. Insurance reports show in the last few years that of 28,814 fires recorded all over the country, 19,008 were extinguished by automatic means, with relatively slight damage, before fire-fighting apparatus arrived.

A single eastern insurance company states that losses paid by it have decreased from more than 25 cents on each $100 of insurance, written during a period when practically no precautionary devices were installed in the plants of the insured, to about four cents on each $100 since adequate protection has been obtained.

MOVIE TITLES GIVEN A VOICE WITH TALKING MACHINE

With the aid of an attachment for motion-picture projectors recently demonstrated in Europe, the "movies" may cease to be known as the "silent drama." The device consists of a talking machine that



Motion-Picture Machine that Reproduces Voices of Characters as Film Is Run Off

can be timed to the movement of the film with such perfection, it is said, that the speeches appear to come from the characters on the screen. As the reels are run the lines of the play can be so reproduced as to do away with the titles and leads.

GRAINS OF DUST ARE COUNTED BY GOVERNMENT EXPERT

To determine how much dust the average individual breathes, the government has detailed a weather-bureau expert to make an actual count of the particles in

Instrument Used by the Government to Determine Number of Grains of Dust in the Air

the air at the top of one of the buildings in Washington. Every day for the past year the test has continued. The grains are collected in a machine and then counted under a microscope, some being so small that they can scarcely be distinguished under the lens.

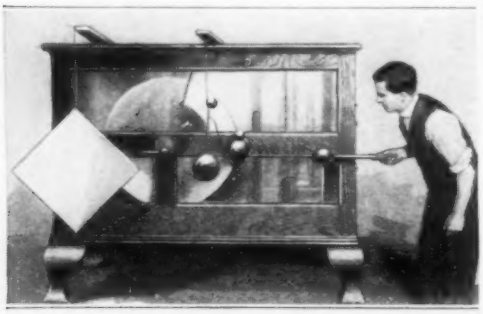
TRADE WINDS TO RID SAMOA OF MOSQUITOES

Experiments conducted by medical authorities in Panama and Cuba proved that the mosquito, unless blown by the wind, travels only a few hundred yards. Acting upon this knowledge, scientists purpose to clear Samoa of underbrush and give the trade winds a clear sweep, hoping that the insects will be blown out to sea. The infection which follows the bite of the pest in that archipelago lowers vitality and subjects the inhabitants to diseases which normally would be thrown off. It is believed that two years will be required to complete the undertaking.

¶Scholars estimate that at the end of the present century the population of the United States will be between 175,000,000 and 200,000,000.

ELECTRIC DEVICE TO CLEAR FOG FROM SKIES IN LONDON

Seeking to eliminate the dense fogs which sometimes hang for days over London, English scientists are experimenting with an electric machine designed to attract the



Copyright, Keystone View Co.

Static Electricity Condenses Fog Particles When Plates in This Cabinet Revolve Rapidly

floating particles of moisture from the air and condense them into water. The invention consists of a cabinet in which sixteen glass plates, side by side, are made to revolve at high speed. Static electricity is generated in this manner and communicated to adjustable brass balls on the outside. A resulting discharge attracts the fog globules, and as they reach the cabinet they are condensed upon a metal plate and run off in small drops. It is thought that a large number of these machines operating throughout the city on misty days may clear the atmosphere in a short time and also be of use in the harbor.

MOUNTAIN OF BURNING COAL IS NATURE'S CRUCIBLE

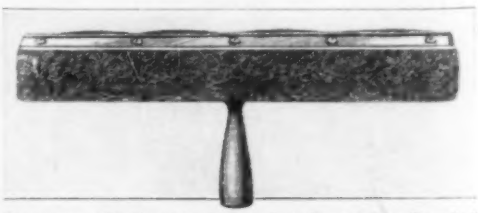
Belching smoke and fire from the caverns and gorges that pierce its sides and summit, a huge mountain of burning coal, in Central Asia, has formed a natural laboratory which manufactures many chemicals. As early as the fifth century, Chinese travelers recorded their visits to the peak, the vapors of which can be seen for twenty-five miles. A peculiar mud, dark in color, oozes from the openings in the heights. People collecting the product are forced to wear shoes with wooden soles, as leather would be burned through. Po Shân, or, to give it its English name, White Mountain, so called from the deposits of alum on its sides, is not an active volcano. It is part of a great coal range which has been burning for hundreds of years.

CITY GIVES HOTEL FOR DUCKS AND SUPPLIES PROTECTION

On the first of every October a western city of more than a quarter of a million inhabitants opens its doors to more than a million wild ducks and spreads a table for them, which is never empty until the last migrating duck has started northward at the beginning of March the following year. Oakland, Calif., is the city, and it has been able to establish and maintain this hotel for ducks because it has a salt-water pool of large size—Lake Merritt—in its midst, where the tides maintain a fresh supply of sea water in the lake at all times. As soon as the first ducks arrive, the gardeners spread for them all the wheat and cracked corn they can eat. This area has been fenced off with a tight woven-wire fence to keep the public out, and there, for the ensuing five or five and a half months, the birds are fed every day. Shooting is not allowed, and the fowl are guarded by a special patrol of policemen, who see to it that they are never disturbed. They become so accustomed to human beings that they walk among the spectators standing outside the feeding-ground fence. Hunters are as much interested in this municipal hotel for wild ducks as are students of ornithology, the tourists, and the humane society.

FELT PAD FIXED TO SQUEEGEE HOLDS CHEMICAL CLEANER

Windows may be cleaned with less effort than is usually required by means of a squeegee that has a felt pad containing

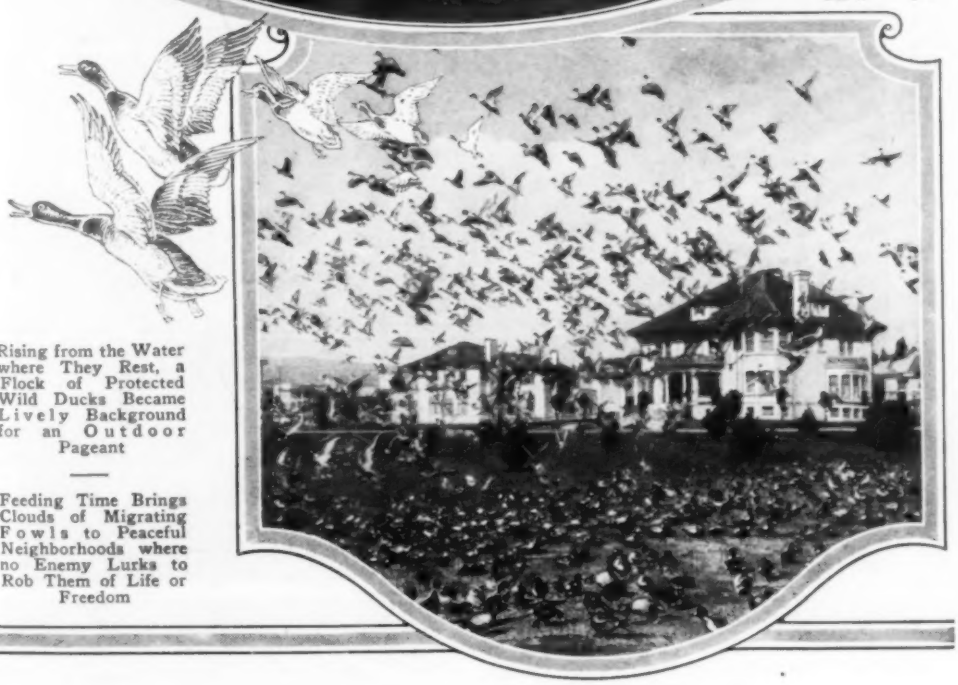


Squeegee with Absorbent Felt Pad Containing Chemical that Loosens Dirt on Window Panes

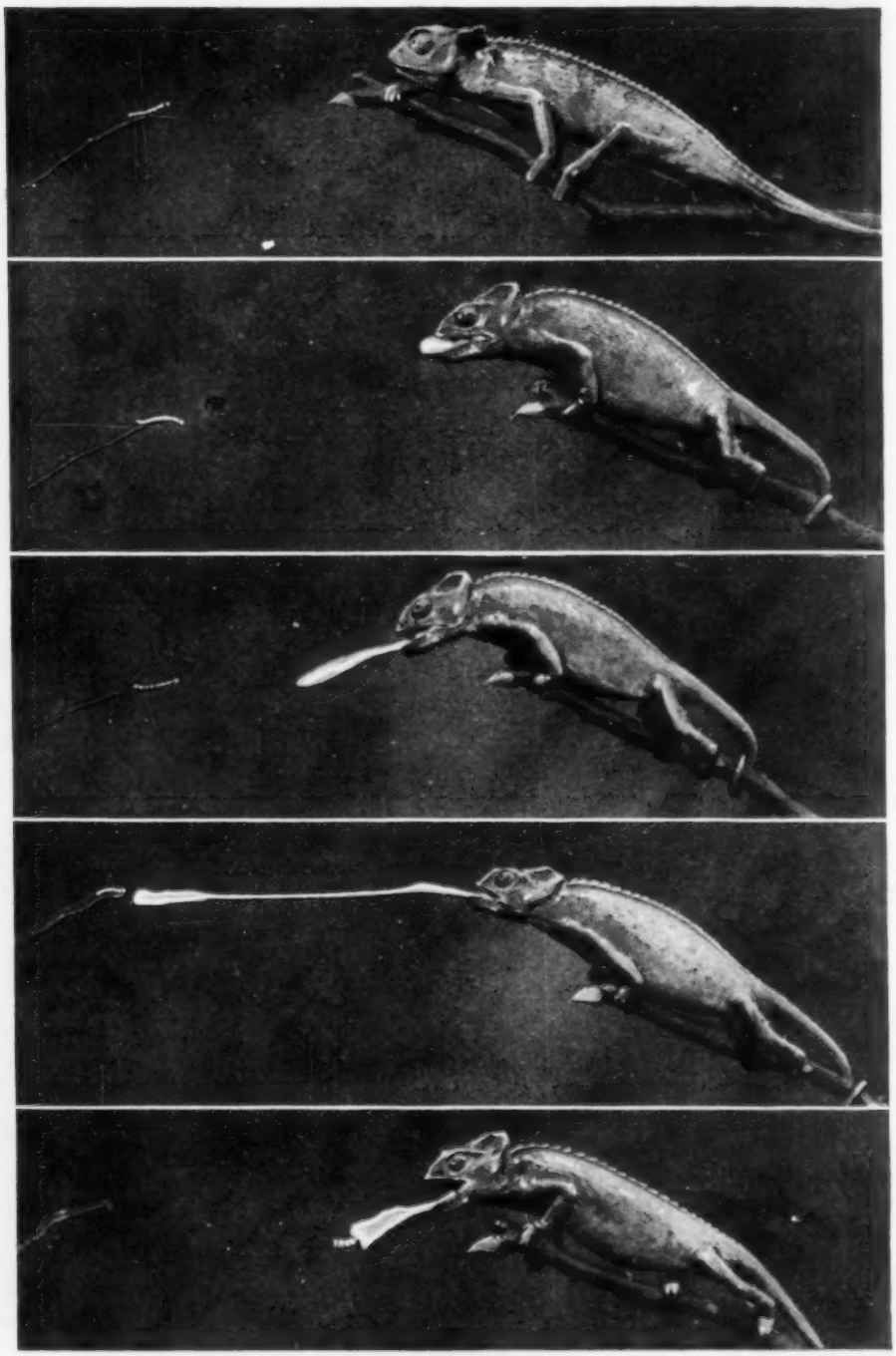
a chemical, fastened close to the rubber scraper. As the tool passes over the glass pane, the pad, which absorbs water, moistens and loosens the dirt. The scraping strip easily clears it from the surface.

¶The world spends $200,000,000 a year for matches, seven for each person being the average daily consumption.

Rising from the Water where They Rest, a Flock of Protected Wild Ducks Became Lively Background for an Outdoor Pageant



Feeding Time Brings Clouds of Migrating Fowls to Peaceful Neighborhoods where no Enemy Lurks to Rob Them of Life or Freedom



Slow-Speed-Camera Pictures of Chameleon Capturing a Worm with Its Long, Flexible Tongue, the Sticky Secretion Holding the Captive Until It Is Devoured by the Reptile

REPTILE TOO QUICK FOR EYE "SLOWED UP" BY CAMERA

By attaining an extraordinary development, the tongue of the chameleon has become the only means of procuring the creature's food. This peculiar organ is long and club-shaped and is covered with a sticky secretion that holds to anything it touches. At rest, it telescopes and folds into the base, which is its narrowest part. In action it shoots out like a flash, often a distance of six inches, to seize upon insects, which make up the chameleon's diet. The ordinary-size lizard of this species can easily capture and devour a large moth within a fraction of a second. In most cases the reptile supports itself by wrapping its tail around a twig while it reaches out for the "shot" at its prey. So quickly does the movement take place that the unaided eye cannot follow it. However, a slow-speed camera was used to show the performance as one of the animals was foraging for food.

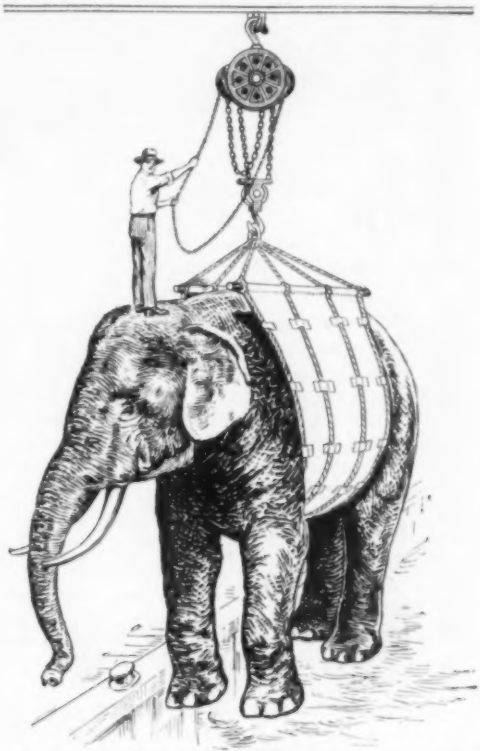
GLASS PANELS REPLACE GLOBE ON LAMPS FOR STREETS

Modeled after the lanterns of Colonial days, street lamps, which are said to give 30 per cent more light at half the cost of other similar types, are being installed in a large mid-western city. Only five of the new lights are needed to a block, it is claimed, whereas nine of some of the older varieties were required. Panels of glass replace the ordinary globes now used and are cheaper and easier to repair. Building fronts, it is said, can be lighted much better by the lantern-type lamps, which also save 10 per cent in wattage. Their simple shape makes them attractive, and they are easily cleaned. They are also adjustable to a hanging fixture as well as to posts.

More than one-third of the world's production of turpentine is consumed in this country.

HOIST RAISES FIFTY TIMES WEIGHT OF OPERATOR

Interlocking cog teeth in the lifting block of a newly-invented hoisting device enable the operator to raise more than



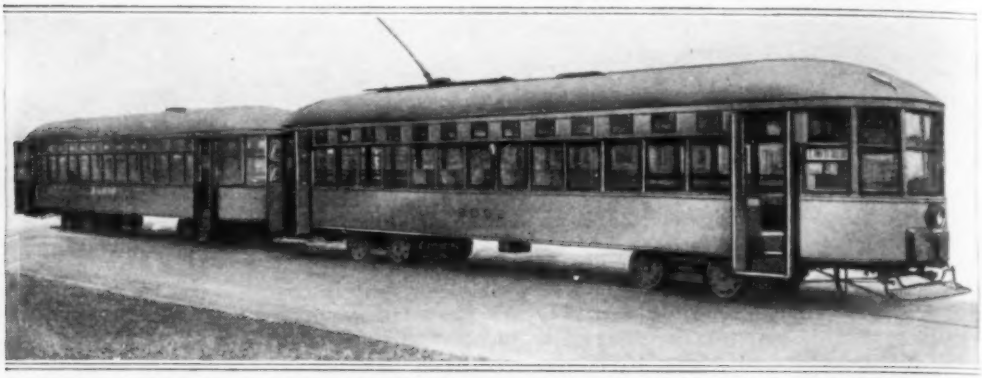
Aided by Cog-Wheel Hoisting Block, One Man Lifted an Elephant Aboard Ship

fifty times his own weight with ease. The mechanism is so constructed that there is no strain on the hands, the stress being absorbed by the parts of the apparatus engaged in the interlock.

GAS POISONS ROOTS OF TREES, ELECTRICITY NOT HARMFUL

Illuminating gas from faulty pipes may poison the roots of trees, but ordinary electric currents never injure their vitality, according to a forester who recently made an investigation of the subject. He declared that the only test for gas was its odor. Boring a hole with a crowbar or an auger about two feet from the street and two or three feet deep, will disclose its presence. Power wires, if badly placed, cause only a cutting or local burning. If no other cause for decay is known, gas may be suspected.

NOISELESS TROLLEY CAR RIDES LIKE AUTOMOBILE



Trolley Cars in which the Usual Roar and Grind Has Been Eliminated by the Use of Automobile Brakes Instead of the Ordinary Iron Ones, and Roller Bearings

With band brakes of the automobile type, and roller bearings, and weighing several thousand pounds less than the average, a street car that is practically noiseless is now being used in a western city. Instead of the customary grinding and roaring sounds, the car is said to make only a musical whirring as it passes over the rails. Several innovations in construction have been used. Among these are wood-inclosed steel frames, double floors insulated against sound, a special arrangement of the springs, and, particularly, the lightness of the car, which weighs only 25,000 pounds. The brakes are controlled with the usual air cylinders. There are four 24-horsepower motors to each car, and the doors are opened and closed by electricity. It may be operated by one or two men or run in trains of two with three men. It has seats for 50 passengers and a maximum capacity of 150.

SHELF ON HANDLE OF DRAWER IS AID IN FILING PAPERS

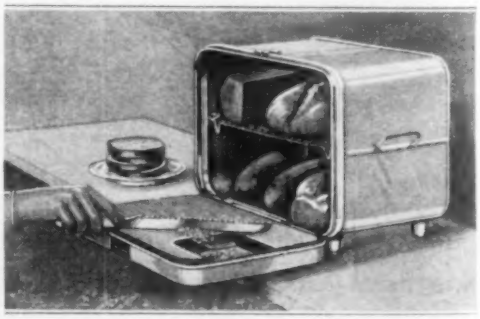
Attachable to the handle of a cabinet drawer, a light, portable shelf has been devised for holding within easy reach papers to be filed or removed. A wire bracket fits easily over the grip and the baseboard sets squarely against the drawer.

PHONE IN VALLEY OF KINGS LINKS TOMBS TO WORLD

Already disturbed by the diggings of scientists and trodden by the feet of thousands of inquisitive sightseers, the Valley of Kings, near Luxor, Egypt, is to be further modernized by the installation of a telephone. Connecting the city with the quarters established where explorations are in progress, a line is being built through the valley by the Egyptian government. At the time the late Carnarvon and his party made their important discoveries there, only the centuries-old paths led through that region.

SLICING BOARD IN BREAD BOX SAVES CRUMBS AND LABOR

Designed to eliminate waste by saving bread crumbs as well as labor, a cabinet with a slicing board that folds into it is on the market. The device consists of a box, which can hold several loaves, a rack, board, tray, and knife, all in one compact utensil. The lid opens downward, bringing the board into a position handy for cutting bread, and the crumbs can be brushed into a compartment provided to receive them.



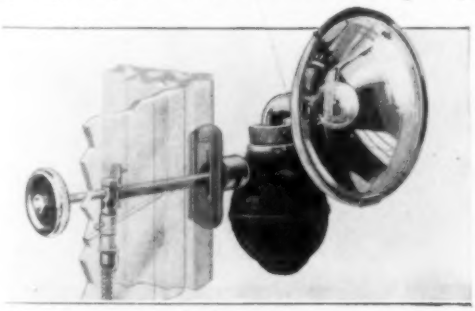
Labor-Saving Bread Box with Slicing Board and Crumb Receptacle in the Lid

FOUR-POUND MOVIE CAMERA'S FILMS ARE FIREPROOF

Suitable for taking short runs of film for home display, motion picture cameras and projectors of simple construction are now being manufactured which are said to produce the images with the steadiness and clearness of the larger apparatus. They are especially adapted to vacation trips, as lengths of film may be joined together forming an "album" of family scenes. The camera weighs only four pounds. Light for the projector is supplied from an ordinary lamp socket, and there is said to be no danger of fire. The film may be halted at any time for a "still" without damaging the reel. The mechanism is simply operated and shows the pictures without flickering.

SPOTLIGHT IS TURNED BY ROD AND HAS EXTENSION CORD

So that it can be adjusted easily from the inside of a closed car without opening doors or windows, a spotlight that can be raised or lowered by a turn of a brass knob has been designed for the convenience of motorists. Held firmly by a bracket, the light is turned by a small rod which ends near the driver's hand. Below the reflector is a chamber in which a 12-foot extension cord, attached to a spring reel, is carried so that the lamp may



Spotlight Adjusted by Rod that Extends inside Car Conveniently Close to Driver's Hand

be removed and taken about the car in making repairs. It also is adjustable to a tree or a table, to provide a convenient light for campers.

¶Decomposition caused by contact of the cream with metallic surfaces in the churn produces an iron lactate that causes the "fishy" taste frequently detected in butter, government experts have discovered.

SHAPE OF LINER'S STERN WINS CARGOES IN ORIENT

Believing that a certain ocean liner is more seaworthy than other ships because its straight, flat stern is like that of a

Triangular-Shaped Stern of Steamer that Is Favored by Superstitious Oriental Sailors

sampan, a form of skiff used for centuries on the coasts of China and Japan, some merchants of those countries endeavor to have their shipments carried on that steamer. The sturdiness of the small boats has become a tradition among the Orientals, and the likeness of the liner to the ancient-fashioned craft gives it preference over more modern boats and secures for it full cargoes. This odd belief is characteristic of the superstitions that sway the native sailors who believe that they are pursued by good and evil spirits all during their lives.

GIANT TELESCOPE TO BE SET ON TOP PEAK IN ALPS

Construction on what is expected to be the world's largest astronomical observatory, is soon to be started on top of Mount Saleve, in Savoy, between Mont Blanc and the Jura Alps, according to recent reports from France. The work is to cost more than $6,000,000, and will require five years for completion. The station will have a telescope nearly four feet in diameter, considerably larger than the instrument at Mount Wilson, Cal., and a powerful radio apparatus will link the observers to the outside world. The location was chosen because of the clear atmosphere at the summit of the peak, which is 4,300 feet above sea level.

Sacking Grain Seeds which Were Carefully Selected and Graded as They Passed from the Thresher

World's Crops Seen in Tons of Seed

MORE than 7,000,000 tons of seed are produced each year on the farms of the world to supply the growers during the planting seasons. The greater portion of this is American grown. No account of the thousands of tons of potatoes, sugar cane, and other bulky stocks seeded annually, is taken in this compilation.

A few years ago the major part of the seed required for farm and garden was grown in Europe, and only since recently have our gardeners been independent of foreign producers. At present, this arm of our agriculture is of vast proportions, encompassing every state in the union. Today the United States has the world's largest commercial seed-growing industry.

Climate and soil make the state of Cali-

Remarkable Crops of Clover Grown on Seed Farms where Stems often Attain Half the Height of a Man

Tons of Seed Are Harvested Each Year and Sent All Over the World to Await the Planting Seasons

forma a leader in the modern seed world. Whereas, a decade ago there were but scattered and small areas devoted to experimental growing in that state, the present acreage is more than 20,000 acres given over to such seed crops as carrot, onion, lettuce, radish, spinach, tomato, and cabbage. These seeds are grown in a maximum of sunshine and matured without rain, and in the majority of cases without the aid of irrigation. The sunshine of the harvest season in that region permits natural drying in an atmosphere free from dampness. Thus, seedsmen are saved the enormous expense of long curing sheds and miles of barns. There, nature performs the work out of doors.

Sweet-pea and mustard seeds are produced in tremendous quantities and the greater part of America's onion seed and sets are also grown in this section. Onions do well in the delta lands of the valleys, and lettuce and sweet peas thrive best on these deep soils, while radishes demand a lighter ground.

Great seed-cleaning machines have been

Gardeners Base Their Yearly Success or Failure on the Grades of Seeds Produced on Farms for Growers

developed, which handle each harvest season, tons of tiny tomato, pepper, cucumber, eggplant, lima bean, and other varieties of seeds. One ton of tomatoes produces only eight pounds of seed, so that it takes more than 9,000 tons of the fruit to give 75,000 pounds of clean seed. Approximately four billions of seeds are gathered every year on one farm alone, just to provide plants for the seed fields.

Tomatoes are picked into buckets which are emptied into water-tight wagons. Passing into the grinding machinery, sharp knives reduce the fruit to a pulp which is poured into barrels. Around the seed at this time is a "pulp sack" so slippery that one can scarcely hold the little globes between the fingers. In order to dissolve this coat, the pulp is allowed to remain in the tanks for about 24 hours to ferment. Then the mass is put into long flumes of running water, which carries away the pulp, leaving the seed at the bottom. The dry seed is graded by passing over screens, and is then packed for market.

Celery seed is one of the most difficult of all to produce. France is the principal source of the choice varieties of this plant, yet seed growers of this country have made a specialty of that crop, which is exceedingly profitable. It takes months to complete the cycle of celery seed.

Of the large species of different flower seeds produced in commercial quantities, the sweet pea leads the list and is the most prolific of all. Due to an almost universal demand, the acreage yield is the highest of any seed crop.

DRESS FORM OF PAPER MAKES AN EXACT MODEL

While the Model Waits, a Dress Form Giving Exactly Every Proportion Is Quickly Fashioned on Her Body. The Finished Form Is Shown at the Left

Dress forms which are exact reproductions of a woman's figure are fashioned from strips of gummed paper stuck to an undergarment on the body of the person for whom the dress or suit is to be made. When finished, the form is virtually a "paper cast" of the model, with proportions so accurately shown that garments fitted to it do not often have to be altered when they are tried on. After the strips have been pasted upon the model, the "cast" is cut down the front and back, taken off and sewed together again. A cardboard base is inserted and the armholes and neck finished. Bothersome trips to the dressmaker's are avoided with the use of this form, or if a woman does her own sewing, she needs no assistance in fitting. The strips are also used in the same way in making children's clothing. The paper model is light, rigid, and is quickly constructed. It is not easily broken or torn and good quality glue on the strips holds them together for a long time.

¶Ten thousand young oysters produced from eggs artificially fertilized in an incubator were recently planted in Cold Spring Harbor. The lot is said to be the first successfully raised in this way and will be ready for consumption in five years.

WORLD-FLIGHT PLANES TO HAVE SPECIAL LANDING EQUIPMENT

Pontoon frames for alighting on water and special gears to enable them to land safely on the ground, are features of the United States army planes that will attempt a flight around the world. Routes for the journey have been mapped out. The trip is to be undertaken to test the possibility of international communication by air routes and to gain information on the operation of different types of machines in various climates. The line of travel has been laid out to avoid extreme rainy seasons in several countries and to reach the cold regions in the summer. Each plane will carry two men, and "hops" of nearly 1,000 miles will be made.

HOME-BAKED BRICKS PROVING POPULAR IN ENGLAND

"Home-baked bricks" is the slogan of the tenants of an English peer of the realm. A huge kiln has been erected on his forested estate to serve two purposes; giving employment to the tenantry and furnishing them with an honest product at a reasonable price. The process of brick

Brick Kiln Erected on Peer's Estate to Aid Tenantry in Building Cheaply and Well

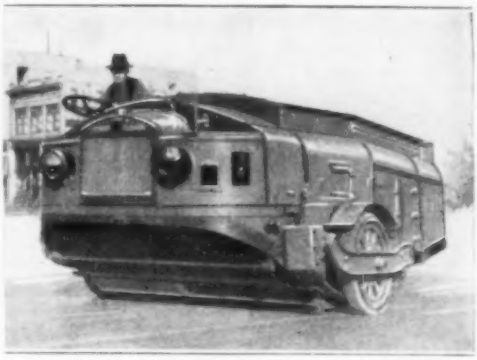
baking requires a heat so intense that twenty-four hours must elapse before the kiln can be entered.

TELEPHONE TESTS LIQUIDS

For testing the purity of liquids, French scientists are using a telephone device. Tubes containing samples of mixtures to be tested are linked with an electric circuit so that the current passes through them. As any adulterant changes the resistance, the variation of the sound in the receiver indicates its presence.

STREETS CLEANED BY VACUUM SWEEPER BUILT LIKE "TANK"

Capable of doing the work of twenty men, a "tank-like" motor-driven street-cleaning machine, has been adopted in a



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Vacuum Motor-Driven Street Sweeper that Does the Work of a Score of Men

western city. The broom sweepers with which it is equipped loosen the dirt, which is then sucked up by vacuum and deposited in receptacles in the interior of the steel shell. The apparatus is said to be capable of cleaning 100 blocks of streets a day without stirring up clouds of dust.

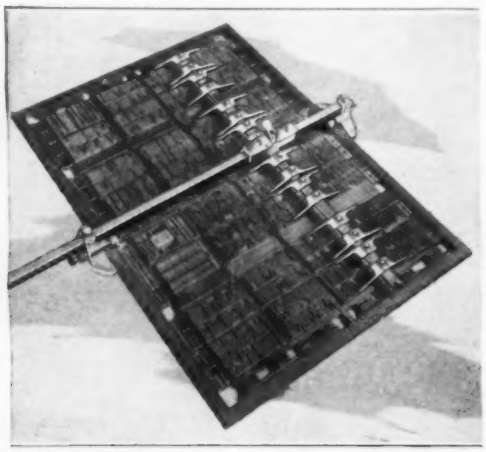
HANDY GASOLINE LANTERN HAS PUMP IN BASE

Something new in gasoline lanterns is one, lately introduced, that has a pump in its base which with a few strokes produces an illumination of 300 candlepower. Its handle is always ready for use, and it is claimed that the invention is safe, that it will burn upside down, will not spill oil when upset, and cannot be filled while lighted. The chimney is made of mica, and the fuel tank holds one quart of gasoline, sufficient to provide a light that will burn for sixteen hours.

¶ Knowledge of coming weather changes shown by birds is attributed to the atmospheric pressure on their nerves.

ADJUSTABLE LINE-UP GAUGE AN AID TO PRINTERS

For lining up page forms of type to be used on cylinder or job presses, an eastern inventor has perfected a device which



Quickly Adjusted to Any-Size Chase, this Lining Device Saves Printer's Time

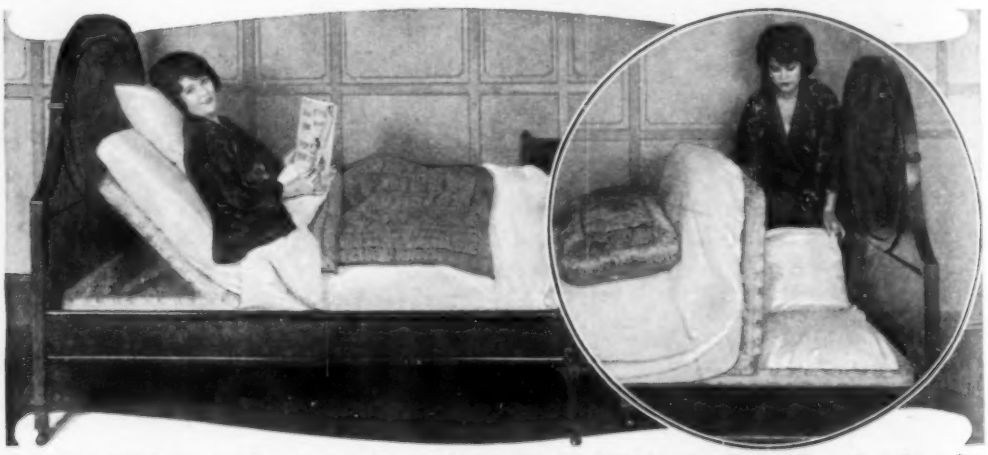
may be attached quickly to any size or shape of printer's chase. It consists of a rod fitted by clamps to the exact center of the chase, and supports a ruled crossbar upon which a series of adjustable steel measuring blades are set at right angles. A locking arrangement holds the crossarm a fraction of an inch above the type and when the instrument has been adjusted to the center, the forms are lined up by sliding the steel "fingers" to the proper spaces indicated on the rule and fastening them in place with set screws. The apparatus is easily detached and weighs only a few pounds.

ALUMINUM TONGS FOR KITCHEN HAVE FORKS FOR JAWS

When taking hot meats from cook pans or picking vegetables from boiling water, housewives can be aided by aluminum tongs that have forks for jaws. Squeezing the handles brings the prongs close together, taking a firm grip on the article being lifted. A steel spring spreads the jaws apart when the pressure stops.

¶Scientists declare that of the 2,000 known varieties of bacteria, only about 100 kinds are believed to be harmful.

BED MADE INTO A CHAIR BY ADJUSTABLE MATTRESS



Turning a Bed Into a Comfortable Chair by Raising the Mattress Which, when Down, Conceals a Space for Pillows and Extra Bedding

Adjustable to various angles, so that a person may comfortably read or eat while lying in bed, a hinged section in a box-spring mattress can be raised or lowered for a back support. Below the movable part, space has been left as a storage chest in which extra pillows or bedding are concealed by the mattress.

Facing Death in the Wilds of Asia

Noted Explorer Tells of Adventures on Lakes and Rivers in Journey Through the Recesses of Little-Known Continent

By SVEN HEDIN

DURING the thirteen years I passed in the innermost recesses of Asia, I have had many notable adventures on the lakes and rivers of that continent. In the course of a journey in the years 1905 to 1908, and while crossing Tibet, I camped at the northern border of Lake Lighten. This is a very large lake, discovered and named by Captain Welby in 1896. Our situation was perilous. The country is uninhabited and there are few pasture grounds. Therefore the strength of our caravan animals had been declining rapidly, and one morning we found eight of our horses and mules dead on the shore.

I wanted to draw a map of the lake and sound its depth. For this purpose I had taken along a collapsible boat with mast, sail, oars, and rudder. On the morning of Sept. 21, 1906, the boat was put together, and I went on board accompanied by one of my servants, Rehim Ali. The water level, smooth as a mirror, reflected clearly the well-defined outlines and the ocher-yellow and brick-red colors of the mountain chain, which rose on the southern shore and was crowned with eternal snow fields and blue shining glaciers.

The rest of the caravan, with 100 pack-animals and 25 men, had been ordered to advance along the north shore toward the eastern end, and there in the evening build

Sven Anders Hedin, noted authority on those little-known lands, Tibet, Turkestan, Mongolia, and central Asia in general, has spent a great part of his life—he is now 58 years of age—in exploring these strange lands. These journeys, performed at times amid extraordinary hardships and always at the immediate risk of lingering and terrible death at the hands of savages or by starvation, have won for him high honors and a world-wide reputation and fame. A noted scientist, a daring adventurer, a fluent writer—he is author of numerous valuable and weighty books—Doctor Hedin is an honorary or active member of nearly every scientific society in the world; is a member of the nobility of Sweden, to which he was raised in recognition of his work by the king; is the bearer of honorary degrees from most of the famous universities of the civilized world; is the personal friend of potentates and rulers, and is now on his way to Asia for another daring journey through the wild interior where he has found strange buried cities, grotesque and terrible customs, and where he has several times been forced to travel long distances on foot without water or food.—Editor's Note.

Battling for Life against Terrific Storm on Bottomless Lake in Asia where Wind and Waves Threaten to Send Frail Craft on the Rocks During Night

up a fire which was to guide us in case we did not finish our course before darkness had set in.

My plumbline was 213 feet long, but found no bottom when we reached the center of the lake. Rehim Ali was scared when he saw one knot on the line after the other plunge down and disappear.

"This lake has no bottom," he said, and kept on bestirring himself, so as to reach the southern shore as quickly as possible.

The lake looked like a plate of glass, but we found we had to traverse a greater distance than we had thought. When we finally reached the shore and sprang out to take our frugal meal, the best part of the day was already over. Therefore, we hastened our repast and then went back on board, rowing in an easterly direction, within a short distance from the south shore.

Where Brick-Red Mountains of Asia Are Crowned with Eternal Snow Fields and Glistening Glaciers

I was looking eastward and devoting all my attention to mapping the outlines of the southern shore. In the meantime Rehim Ali was busy rowing, his eyes turned toward the west. He kept scanning the westerly horizon, without saying a word. Gradually he became uneasy, and at last he whispered, in a voice almost smothered by fright: "There's a storm brewing in the west—it will break in a little while!"

I turned around. The sight was indeed alarming. From the western plain there rolled over the lake dense, yellow clouds, edged in below with dusky stripes. They looked like immense pillows and mattresses, and whirled along with them a deal of dust.

"Had we not better land?" asked my servant.

"No, we go on. You set the mast and hoist the sail; we are getting fair wind!"

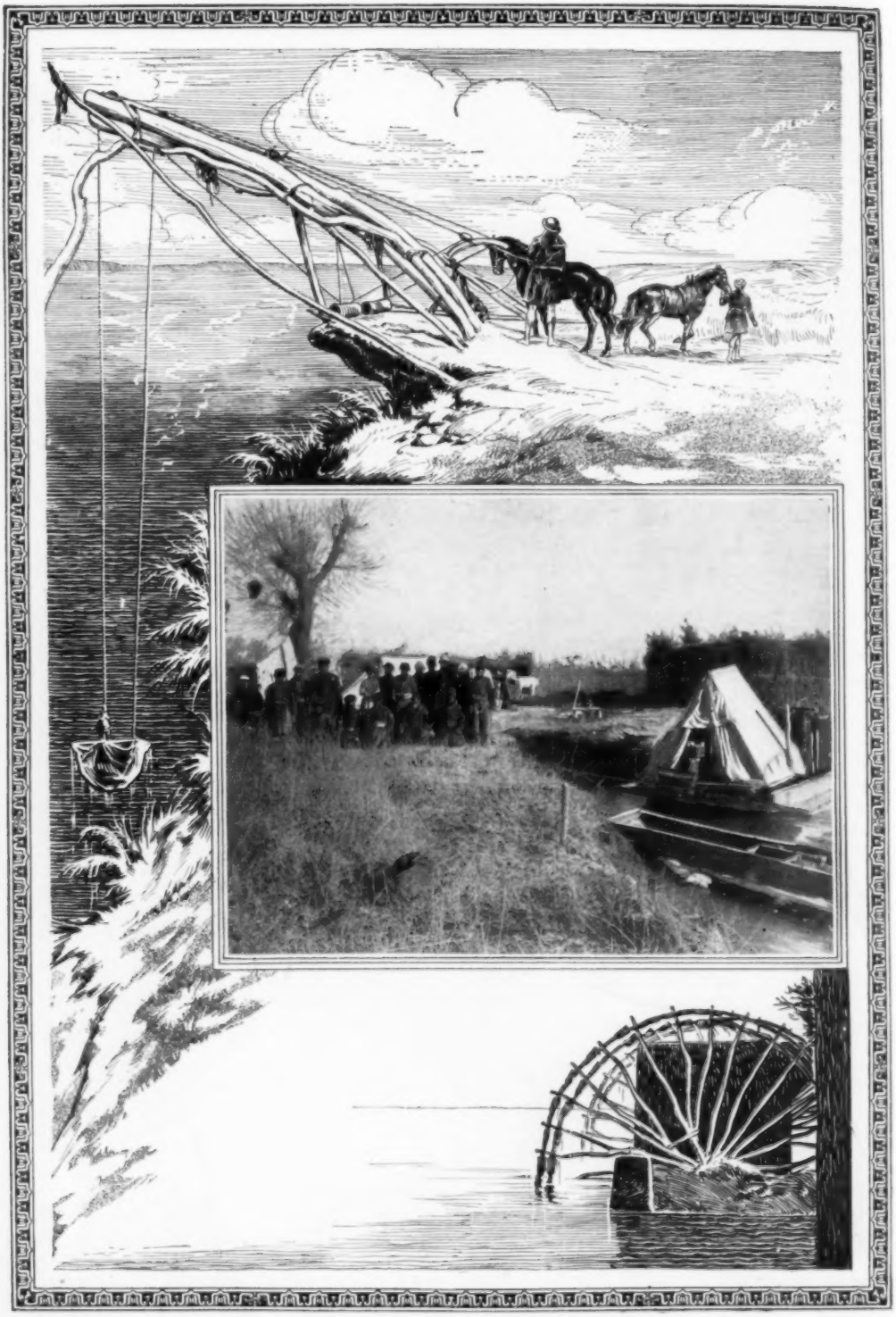
He obeyed and had hardly finished setting up his simple rigging when the first squalls, ushering in the storm, came whistling over the mirrorlike lake, bellied out the sail and whipped up the waters so that they rose in mighty billows within a few minutes, threatening to upset the craft.

The boat, sped on by the sail, flew over the lake like a wild duck. The waves sprayed madly around us; their crests, whitewith foam, parted and were carried hither and thither, gurgling and hissing. I had the ropes well tightened, but so they could be released by a pull of the hand. The sail was filled and expanded by the wind, and I was holding the tiller with a firm grip to keep the boat in the direction of the wind. With breathless speed we swept by one sand-strewn neck of land after the other. They were surrounded by shallows, and if we had struck upon the bar the boat would have capsized, filled with water and gone down like a stone.

Frantically Rehim Ali ejaculated his prayer: "Jah Allah, jah Allah!" For a while he looked like a hedgehog that rolls itself up for defense, but finally, paralyzed with fright at the spectral billows, he sank down and lay like a corpse.

The storm had now grown to a hurricane; the danger was imminent that the mast might snap off and that I should lose all control over my frail craft. Impenetrable as the gloom was, I had to guard against our being flung on the east shore by the maddened gale, for the reefs would have dashed us to pieces. So I had to keep at the helm and I shouted to Rehim Ali: "Keep a good lookout!" but he heard nothing—he failed to move.

One dreary hour passed after another.



Primitive Devices for Hoisting Water from the Rivers for Irrigation with the Aid of Horses or Oxen that Are Still Used in Asia, and a Party of Explorers

Turkish Ferries that Are Known as "Schahtur" and Are Tied Together to Give Greater Steadiness

What an endless night! But at last in the midst of all the turmoil a heavy sound of a peculiar kind reached my ear, and a few minutes later I discerned the white edges of the breakers beating against the shore.

"The next wave will hurl us on the shore! Jump out and take hold of the boat!" I called to my servant, but the stupor still bound him. So I let go the rope, threw him overboard and jumped out myself on the other side. Now the poor fellow came to his senses, and with united efforts we hauled the boat up at the same moment the returning wave was about to snatch it out again to the open lake.

We had been in the water from the waist down, and the water on our clothes turned to ice. However, we did what we could to overcome the effects of this nerve-racking bath.

Along in the night we saw a glimmer of light in the north. Some of our party, anxious about our long absence, had gone out to search for us, the man who rode ahead carrying a burning torch mounted on a pole. At last we were safe in our warm tent!

Now I come to a journey of quite another kind: six hundred miles down the River Euphrates, on a ferry driving with the current. This was in March, 1916, while the war was raging. I had been invited to Bagdad by my old friend von der Goltz Pasha, who, as the highest connecting link between the German and the Osmani army, had been placed in command of the Sixth Turkish army.

In Aleppo I was invited to accompany, in an automobile, two officers who had been charged with carrying to Mosul three automobile trucks with benzine tanks, investigating at the same time the land-route over Nisibin to the last-named city.

The Bagdad road had been finished from Aleppo to Ras-el-Ain, and to this point the autos were transported in the train; from there on we made use of the motor cars themselves. The sky was overcast. We passed the nights in our tents in the desert. The farther east we came, the worse we found the road to be.

Outside the village of Bir-dava, south of Mardin, we ran fast in the sand-dunes on March 30 in such a way that there was no chance for us to extricate ourselves. The next night there were heavy downpours. We dug trenches around the tent to keep the water from submerging us. For a whole week, day and night, we lay on our artificial island, imprisoned by the deluge around us. I felt infinitely glad when, on the morning of April 9, I was back in Ras-el-Ain, having left behind me most of my baggage.

Near Jerablus, where the Bagdad road crosses the Euphrates, I alighted from the train and bought two Turkish ferries called "schahtur," which were tied together to give greater steadiness. On the ferry was laid a deck, on which a cabin was built containing my field-bed, a table, and a chair. From the bed-head I could, through a small window, look out on the port-side over the river and the bank. On the starboard side there was also a window, which afforded me a chance to have a sight of the right-hand river bank. The double ferry was 22 feet long and 16 feet wide, with two oarsmen at the front corner and a man at the helm in the stern. I had a crew of three men, Muhamed, Husein, and Kerit, and also a police-soldier.

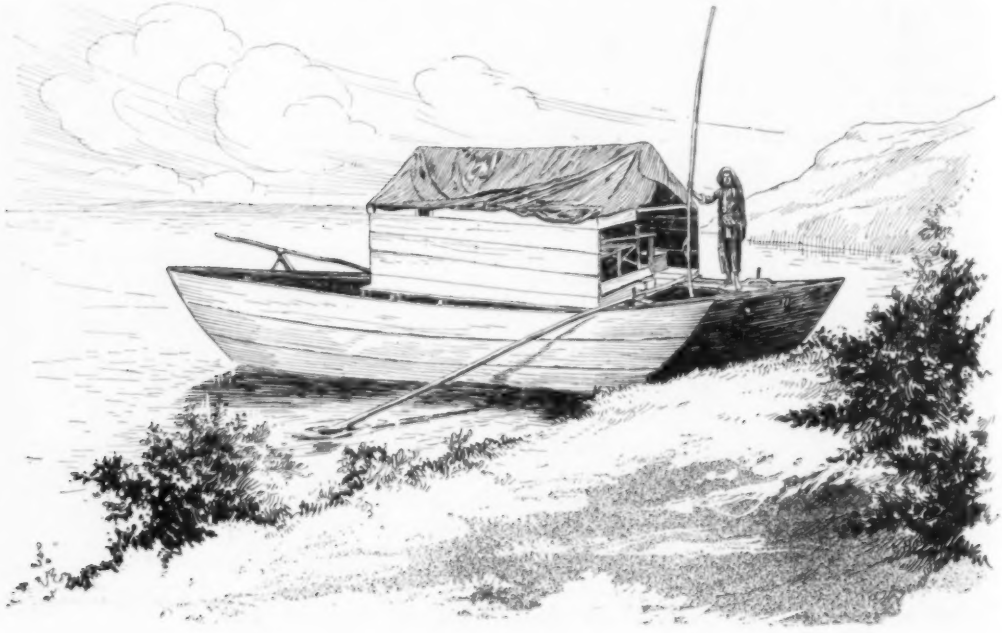
"Bismillah! In God's name!" sounded the call in the afternoon of April 12, and the ferry was seized by waves of gigantic size and floated down stream. At nightfall we moored our vessel at the right-hand bank and passed our first night on board. The next day we resumed our voyage down the imperial river. I sat at my desk, with the compass and watch before me, and drew a map of the winding Euphrates.

Everything went well until on April 18 we had an adventure which came close to putting an abrupt stop to our advance. We had just passed by the large village of Raka, when the sky became gloomy. The flashes of lightning and the claps of thunder increased; at times we seemed to be wrapped in fire. I had directed the men to fasten an oil-cloth tent on the roof of the cabin with spikes, to make it waterproof. At a spot where the Arabs were busy hauling up the water, we saw them suddenly stop and retire to their primitive homes, driving before them their oxen and horses. They were right in surmising that the windows of heaven would open anon and bestow on them enough of the liquid element to render their efforts superfluous.

The rain, indeed, was brisk. The ferry made its course quietly along the right river-bank. Suddenly the rain stops, the thunder dies away, and for a moment everything is silent. But a moment later the storm breaks out in majestic rage. It was 5:25 p. m. and the 20 minutes which then followed I shall never forget. First a few heavy drops; then a tropical downpour, piercing, torrential! The hurricane came across the river with a stunning effect. The ferry stopped instantly in its course and swung aside. The cabin acted as a cave of the winds. Within a few minutes billows, crowned by foam, were rolling in over the rail. The ferry rapidly filled up with water and threatened to drag with itself to the bottom the other ferry whereon stood the cabin.

Because of the tremendous pressure of the storm against the cabin, the ferry on the starboard side was squeezed leeward so violently that the rail came to lay on the water. Even here the billows rushed in. The slightest increase in the pressure and down we should go! In the twinkling of an eye I snatched up maps, books, and instruments, rolled up everything in the rain-cloak, and threw myself in front, to support with all my strength the luff wall of the cabin—for this structure might at any moment be dashed to pieces. The tent cover was pulled loose from its spikes and tossed around in all directions.

But salvation was at hand! Some dark objects became discernible through the vapor. These are the tamarisk trees at the left bank! The ferry touches firm ground; we are rescued at the very moment when we thought all was over, the storm ceasing as rapidly as it had broken out, it having lasted but 21 minutes in all. But we had to stay there for a few days for repairs before continuing our journey.



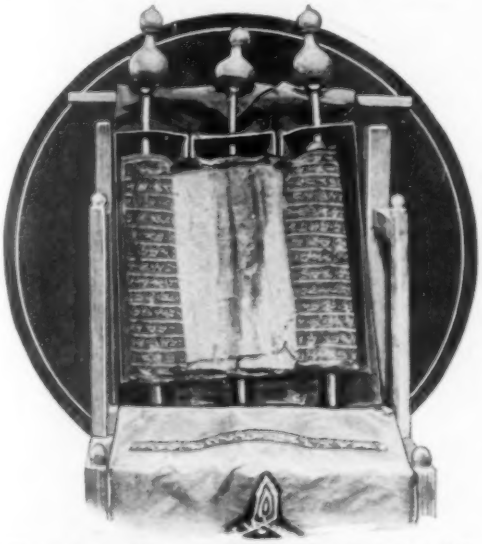
VESSEL OFF BALANCE DEFIES EFFORTS TO RIGHT IT

After passing through rough seas in a severe storm on the Pacific Ocean, a vessel loaded with lumber and dynamite sailed into port recently with a heavy list. The tossing it received during the squall caused the cargo to shift, throwing the great hull off balance. Valiant work of thirty men for two days failed to right the craft, owing to the difficulty of handling the immense piles of timber. The explosive aboard also made the task extremely dangerous because of the cramped space.

Vessel Loaded with Lumber and Dynamite Was Thrown Off Balance by Shifting Cargo

LIGHT ON BIBLE TEXTS SOUGHT IN AN ANCIENT SCROLL

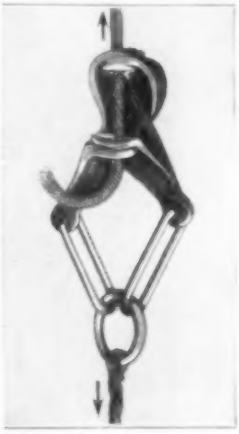
What is believed to be the oldest book in the world, a copy of the Pentateuch, is the prized possession of a sect of Samaritans who live in Palestine. Guarded with the utmost care in a case of copper, it is exhibited only at feast times, and is then uncovered from its silken wrappings only far enough to permit one column of the scroll to be seen. The parchment is 70 feet long, and scholars have found that toward the end of the manuscript the name of the writer and the date are so intermingled with the text that little doubt is held as to the genuineness of the document. Photographic reproductions of the entire scroll are being taken for the first time and distributed among Hebrew scholars. They are expected to shed light on various scriptural controversies.



Wrapped in Silk, the Ancient Scroll Is Carefully Preserved in a Copper Case

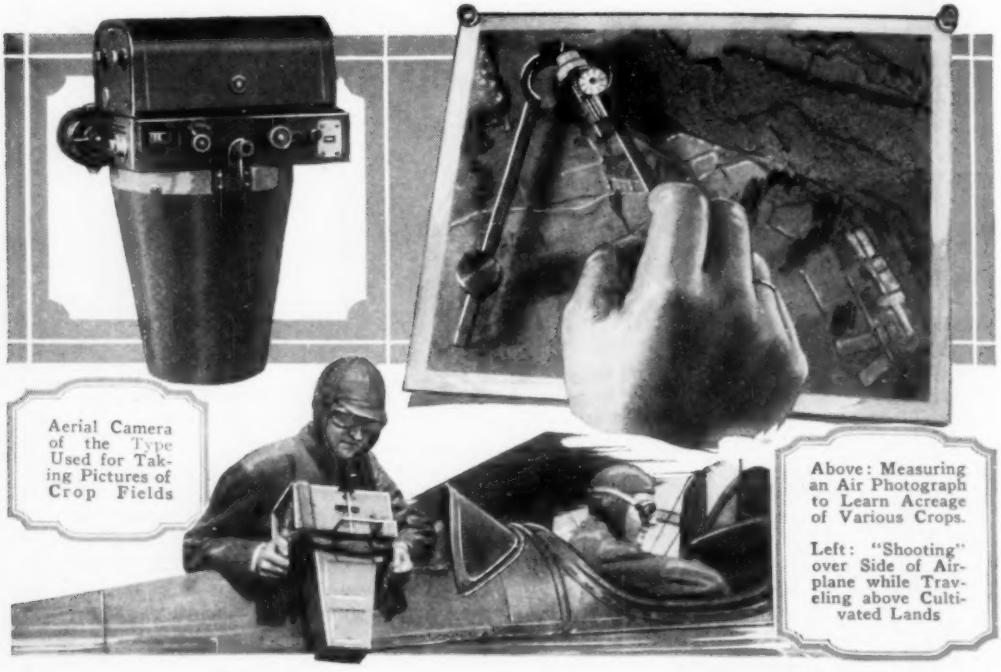
DOUBLE JAWS ON CABLE GRIP TO DO AWAY WITH KNOTS

Steel cables or wire ropes can be fastened to posts or ground anchors without the use of knots by a grip with two sets of jaws. The rope cannot slip, it is said, because as the pull upon the jaws increases, their grip tightens. A spring attached to the hinges prevents the hold from releasing too quickly when the strain is removed. The device is of especial aid in tying guy wires, and saves time formerly used in wrapping and twisting the strands.



¶ Coloring for electric-light globes is now put up in handy 2-ounce bottles and may be obtained in twelve different shades. The substance is easily removed with wood alcohol.

PHOTOS TAKEN FROM AIR SHOW CROP ACREAGE



Aerial Camera of the Type Used for Taking Pictures of Crop Fields

Above: Measuring an Air Photograph to Learn Acreage of Various Crops.

Left: "Shooting" over Side of Airplane while Traveling above Cultivated Lands

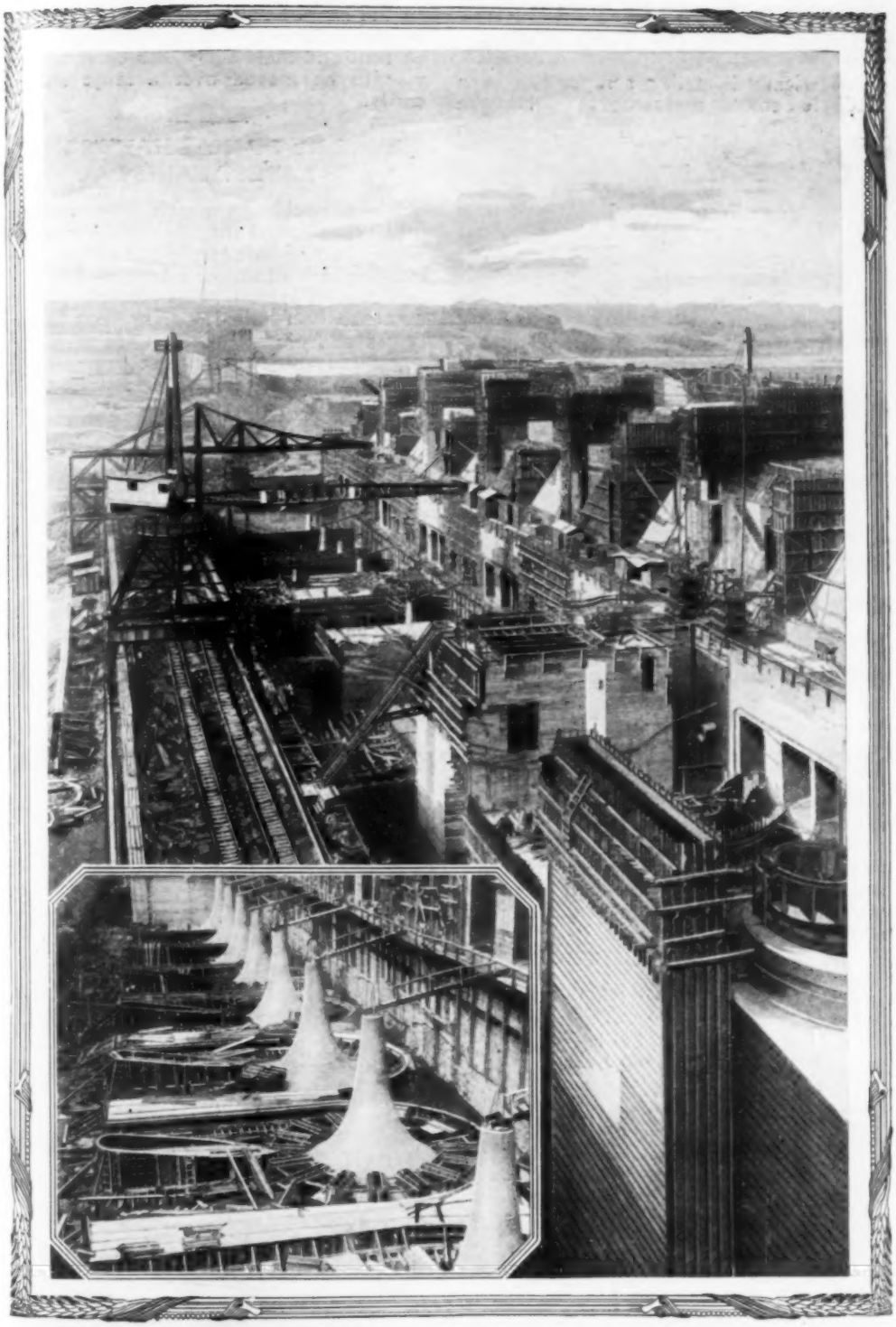
By taking pictures of planted fields from an airplane, government estimators are able to obtain photographic evidence on which to base their reports of crop acreage. The camera used takes pictures at the rate of one a minute while the plane flies 80 to 90 miles an hour at heights of 2,500 to 7,000 feet. The actual sizes of the fields are calculated by measuring the distance in inches on the picture with a "planimeter," and since the altitude of the plane had been recorded, the scale is worked out in acres. Different crops are easily recognized by this method, even when large areas are measured. In three hours, aerial pictures of 250 square miles of fields were obtained. Estimators also are enabled to gain valuable information as to the condition of the crops by flying at lower altitudes.

GERMS TO HELP RUN ENGINES BY PRODUCING GAS FUEL

Methane, one of the gases used for motor fuel, is being produced in commercial quantities in India with the aid of germs that convert a mixture of sewer sludge and sawdust into various compounds of which the gas forms an important part. The tiny creatures are cultivated in air-tight tanks kept at a warm temperature. They multiply rapidly and by working on the mixture produce acetic acid and carbon gas as well as methane. Marsh gas, frequently found in stagnant pools, is largely the result of their presence and causes decay and fermentation of vegetable matter. Banana stems and skins have been found to yield as much as 81 per cent methane when acted upon by certain kinds of germs.

"WHITE POWER" OF TWO DAMS TO YIELD FARM RICHES

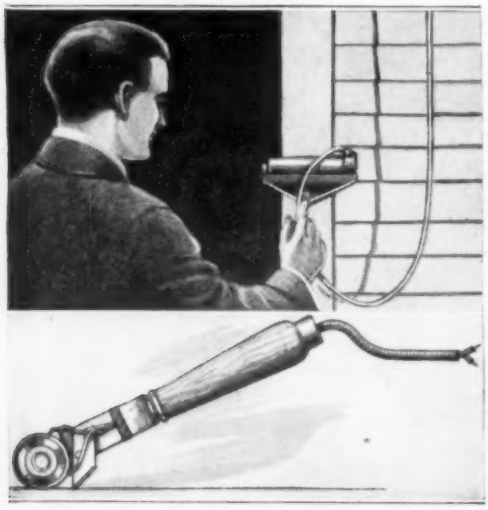
Nearly 1,000,000 horsepower will be made available for making fertilizing material when the Wilson Dam across the Tennessee River at Muscle Shoals is completed. With another dam, fifteen miles up the stream, it is estimated that the water will supply more than 800,000 horsepower and electricity furnished to operate a chain of factories. The fertilizer is to be manufactured from a combination of nitrogen extracted from the air and phosphoric acid taken from native rock near the shoals. Thousands of tons of concrete are being used in building the huge dam and power house. A steam plant, developing about 100,000 horsepower, which has been built, will supplement the other units.



Harnessing Nearly 1,000,000 Horsepower with Monster Wilson Dam, a Part of the Muscle Shoals Project: Concrete Foundations for the Turbines Are Shown in the Lower Picture

ELECTRIC SCRAPER FOR PAINT DOES WORK OF TWO TOOLS

Electrically heated, a scraper has been made that softens and removes paint at the same time. The heated roller melts the surface, while the cleaning tool attached to the same handle removes it. A cable suspended over a winding drum carries the current and makes it possible for the device to be moved over a large surface easily.



Electrically Heated Paint Scraper Melts and Removes the Surface at the Same Time

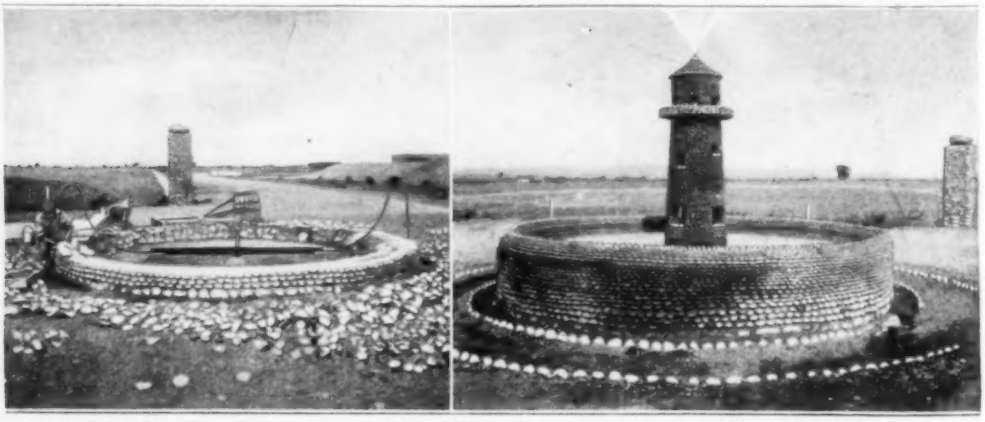
JEWELRY OF ELEPHANT'S HAIR IS LATEST PARIS FAD

Rings, necklaces, watch fobs, automobile mascots, and the like, made from the bristly tuft of hair at the end of the African elephant's tail, have aroused curiosity in Paris. Formerly, this rare commodity was used on milady's hats, but today, prices of from $50 to $100 are asked for any unique design required by a purchaser. The strands, after being cleaned in a chemical bath, are dyed in permanent colors, combed, and electrically dried. The plaiting and weaving of the bristles into rings occupies from half a day to several weeks, depending upon the pattern, and collectors are assured that jewelry made from elephant hair will outlast that made from the precious metals.

¶ Fibrous material which is said to make good paper is obtained in Jamaica from the banana palm after the tree has been cut down and the fruit harvested.

COBBLES USED TO BUILD NOVEL PRISON FOUNTAIN

To show the desired form of a circular cobblestone fountain, without making a mold, the superintendent of a western prison constructed a frame of wood and iron pipe, shaped like a cross-section outline of the completed work. This revolved on a wagon axle placed upright in the ground. Inexperienced workmen formed the ornament guided by the moving frame. A miniature lighthouse was built of stones placed around a galvanized-iron form. A "run-around" near the top of the tower was made on a base of wire netting attached by several small steel rods.



Miniature Lighthouse and Fountain Built of Cobblestones by the Convicts in a Western Prison Who Used a Revolving Wooden Frame to Make a Perfect Circle

SALMON FISHING RIVALS MINES IN IMPORTANCE TO ALASKA

Rivaling in importance the development of its mineral resources, Alaska's salmon fishing industry has become one of the major occupations of the territory. From a small beginning in 1878, when Chinese laborers caught and packed the fish in crude, handmade cans, the business has grown until it employs 25,000 men annually. Canneries equipped with the latest types of time-saving machinery, now dot the coasts and river banks and the value of the catch amounts to millions of dollars every year. In 1918, the peak of production was reached with a pack of nearly 7,000,000 cases. This was due to war orders and because many waters were nearly fished out at that time. Efforts have since been made to re-stock them and to bring the industry back to a stable basis.

WRINGER ON BLACKING BOTTLE SAVES FLUID

Excess quantities of liquid shoe dressing in the dauber before it is applied are removed by an attachment, lately introduced, consisting of a notched upright clamped to the neck of the bottle. The swab is held in a groove and turned and squeezed before it is withdrawn. Economical and proper use of the dressing and increased durability of the leather of shoes are assured with the aid of this device which also is more economical.

LIBRARY "DOCTOR" GIVES FIRST AID TO WORN BOOKS

In a large public library of a mid-western city, the average life of a circulating volume is little more than three months. During its frequent handling, damage to both the pages and the binding results, which necessitates repairs by the "hospital," where skilled workmen mend the slightest injuries. Torn leaves are repaired with transparent paper, and if a new cover is needed the book is sent to the bindery. More than 8,000,000 withdrawals were made through the institution's 45 branches last year. When new stocks are received they are sent to the repair room, where a permanent number is stamped on them and a catalog label is printed on the back.

Book "Doctor" in Library Repair Room Stamping New Volume with Permanent Catalog Number

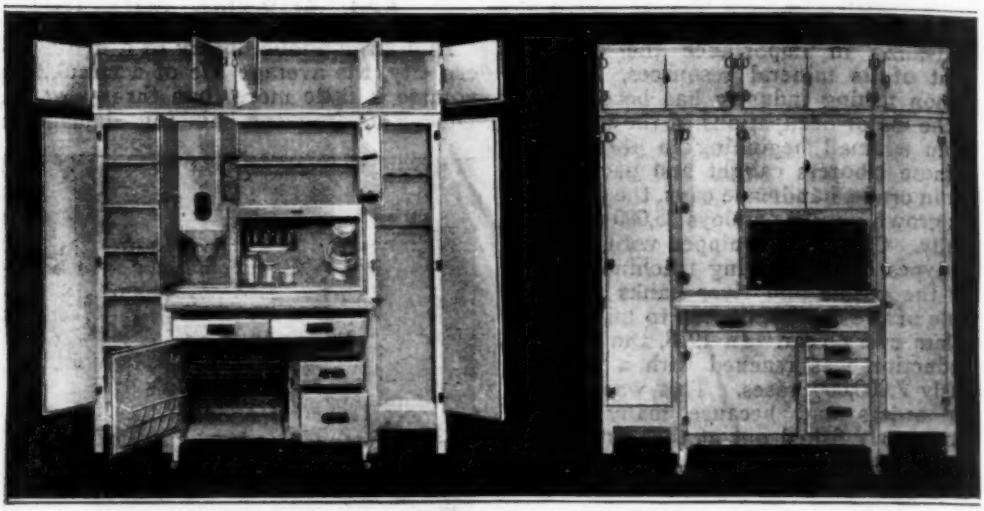
PHONE WIRES HUNG TO BOTTLES

Broken insulators on the telephone poles have been replaced with the necks of bottles in a remote section of New Zealand. The wire is wound about the glass and is prevented from slipping off by the collar at the top.

Answers to "Can You Name Them" Puzzle

THE correct names of the articles shown in the January issue under the heading: "Can You Name Them?" are as follows: No. 65, inkwell. No. 66, cuff link. No. 67, hair fastener. No. 68, stopper for ink bottle. No. 69, rotary toothbrush. No. 70, electric clock. No. 71, curry-comb. No. 72, liquid soap fixture. No. 73, dauber for liquid blacking. No. 74, electric push button. No. 75, toasting device. No. 76, comb cleaner. No. 77, egg beater. No. 78, lifter for hot dishes. No. 79, dish drainer. No. 80, artist's easel.

SHELVES ON KITCHEN CABINET SAVE SPACE

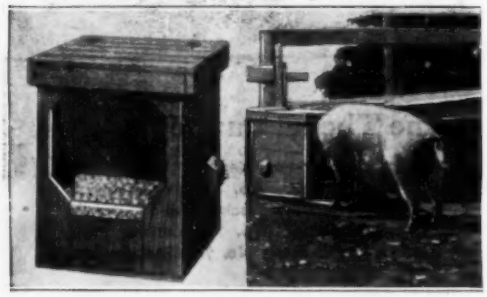


Cabinet Surrounded by Shelves and Closets that Save Housewife Time and Space in Kitchen

To save steps in the kitchen, shelves and cupboards for storing food, china, and cooking utensils are built around a cabinet recently marketed by a mid-western manufacturer. Particularly of value in apartments or homes which afford slight space, the cabinet is said to have enough room to store practically every untensil used by the housewife. Things can be kept clean, for all compartments are closed. There are no nooks where dust can collect, as the doors have no panels and the inside corners are rounded to make them easy to wash.

WATERING TROUGH FOR HOGS CAN'T FREEZE IN WINTER

Insuring a constant supply of fresh water for hogs at all times, a fountain now being marketed is provided with a small kerosene heater for use during cold weather. In the warm season it requires no attention, for the flow is regulated by a control, and in the winter months the oil lamp needs refilling only two or three times a week. This heating system takes the chill off the water, making it more suitable for the animals. A swinging door over the drinking basin keeps out dirt. The fountain may be attached to the side of a watering tank for other stock, or it may be connected with the well or pump by an underground pipe.



Fountain Water Trough for Hogs with Heating System for Use in Winter

JAPANESE SEE QUAKE RECORD WHILE FAR FROM HOME

While thousands of their countrymen were being killed and maimed and cities were laid in ruins, a party of Japanese delegates to a scientific congress witnessed the tracings of the disastrous tremors on a seismograph in Sydney, Australia, nearly 5,000 miles from the scene of the recent tragedy. As the visitors were examining the instrument at an observing station near the city, it began to tremble violently. Making calculations as the record proceeded, the officer in charge located the disturbance as arising near Tokyo. These highly sensitive seismographs are now capable of recording the slightest tremor caused by a disturbance of the earth's crust in any part of the globe. The instrument is usually placed upon a concrete

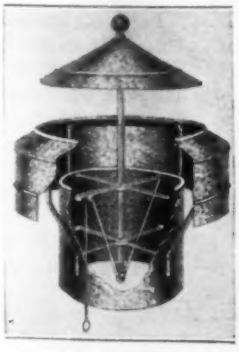
pier resting on bed rock, through which the vibrations are carried to the recording apparatus, by which they are traced upon a photographic film by a beam of light. The direction and the distance of the disturbance from the instrument, and the character of the "waves," are determined from the readings. It is estimated that the average earthquake vibration travels at the rate of about 142 miles a minute.

LIGHT FROM MOUNTAIN ROCKS MAY BE RADIO RAYS

Rocks that shed a peculiar light, the rays of which are said to produce a painful rash on the skin and to rust metal, have been found on the crest of a mountain in the wilds of New Pomerania in the Bismarck Archipelago of Oceanica. Scientists believe that radium or a radioactive mineral may be found in them. Only three persons are said to have climbed the mountain and experienced the effect of the glow which can be seen for miles. Those who have stood where the queer light could strike them have been afflicted later with a rash that lasted for several days. An expedition is to be sent out by the Australian government, it is reported, to make borings into the mountain and to analyze the rocks.

LIFT-TOP BUILDING VENTILATOR HAS STORM-PROOF COLLAR

Among building utilities lately introduced is a device which provides any degree of ventilation necessary to remove impure air. It has an encircling collar which keeps out rain, hail, sleet, snow, and wind, thus insuring operation even under adverse weather conditions. When closed, the cover serves as a damper. With a pulley and chain attachment, it is easily moved. This service is performed by a single shaft when a series of them are used in a structure. Another feature is a fusible link which melts in case of fire, dropping the lid and cutting off the draft which otherwise might fan the flames. The apparatus is also manufactured with a glass top.



HUGE GRANARY HOLDS YEAR'S GRAIN FOR SMALL NATION

Enough wheat to feed 500,000 persons for one year can be stored in a grain elevator recently built at a railroad terminal

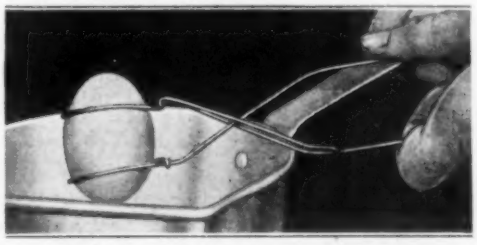
Copyright, Underwood & Underwood

Huge Granary that Will Hold Enough Wheat to Feed Half Million Persons for a Year

on the eastern seaboard. The structure, said to be the largest of its kind in the world, will hold 2,500,000 bushels. Figuring the United States average per-capita consumption at about five bushels per year, the supply in this huge storehouse is sufficient to feed some of Europe's hungry nations for 12 months. The quantity that can be kept in this granary is estimated to be about one-fifth as much as the total crop of Iowa.

HOLDER FOR EGGS GUARDS HAND FROM STEAM

Lessening the risk of burning the hands or breaking a hard-boiled egg in removing it from hot water, a lifter that is made of



Holder that Lessens Risk of Burning the Hands or Dropping Boiled Eggs in Lifting from Water

strong silvered wire, has been devised in Europe. A spring on the holder grips two rings in place at the ends of the egg, which may be released by pressing the handle.

CORTES' GARDENS STILL WONDER OF MEXICO

AFTER four centuries, the gardens built by Cortes, the conqueror, are still one of the wonders of Mexico. Long lines of great trees, interspersed with stunted evergreens, border the drives and stretch away in wondrous vistas. Dwarfed firs have been trimmed by the landscape gardener, into geometrical designs, spheres, pyramids, cones, and the like, and the sight-seer gazes down a row of emerald globes which seem to grow smaller in the distance, but which are, in reality, all of a size.

The Spanish leader entered Mexico with only a handful of followers, overthrew the Aztecs, and destroyed their civilization. Later, he laid out the gardens, six miles south of the capital, and they have remained untouched by the revolutions which have ravaged the country. The great soldier returned to Spain and fell into disfavor with his sovereign, who repaid the services of a lifetime by demanding to know who he was.

"I am a man who has given you more provinces than your ancestors left you cities," was the proud answer of the grandee, who, in disgust, retired to obscurity, and died in neglect.

The impression conveyed by this park is one of somberness and tragedy, well in keeping with the life of its creator, and the care with which it is tended should preserve it for many years to come.

"STEAM LAUNDRY" FOR HOME EASES WASHDAY LABOR

Operating without complicated attachments, a washing machine for home use has been devised to cleanse clothes by forcing boiling water through the garments under strong steam pressure. The apparatus consists of a copper and steel receptacle equipped with a dome-shaped cover, and may be placed upon an ordinary coal stove or over a gas burner. As steam rises, a partial vacuum is created which forcibly drives boiling water through perforated tubes in an inner jacket of the kettle down upon the clothes and through holes in a false bottom. Circulation is maintained at the rate of 162 gallons a minute and this action makes rubbing the clothes unnecessary. For articles which cannot be boiled, a geared rotating plunger is provided in the top.

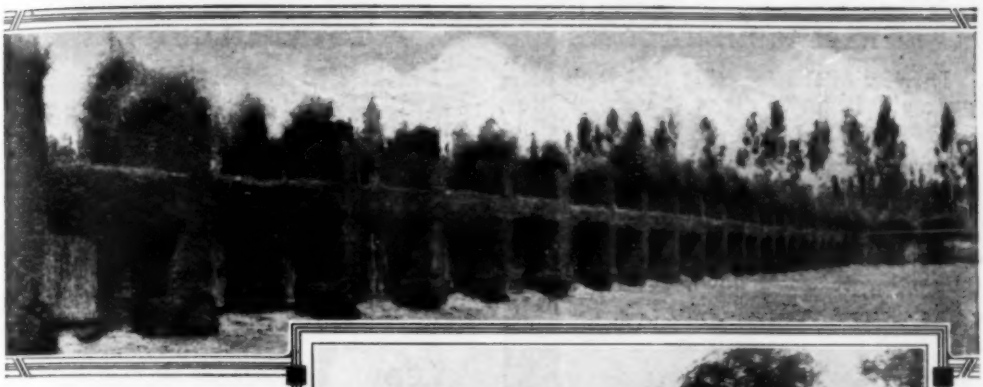
"Steam Laundry" for Home Use May Be Placed upon a Stove and Runs without Machinery

DUMB WAITERS IN STORE RUN FROM 6-INCH SWITCHBOARD

Fourteen electric package elevators of the dumb-waiter type are controlled by an operator and a switchboard in a department store of one of the large cities. Any number of the "lifts" can be moved to various floors by simply pressing buttons on the control panels. When an elevator is needed, the floor attendant signals "central" by a key at the side of the shaft. A light on the board notifies the operator, who then directs the proper carrier to that point. When it arrives, the signal light goes out. After it is loaded, other signals are used to indicate the floor to which delivery is to be made. Each lift has a corresponding panel allotted to it on the switchboard with rows of lights representing the floors.

STATUE CAST IN GLASS

Cast in glass, and over twenty-four feet high, a statue of William Shakespeare has been made for a London park. The model was first made in clay. No figure as large as this has before been made from glass.



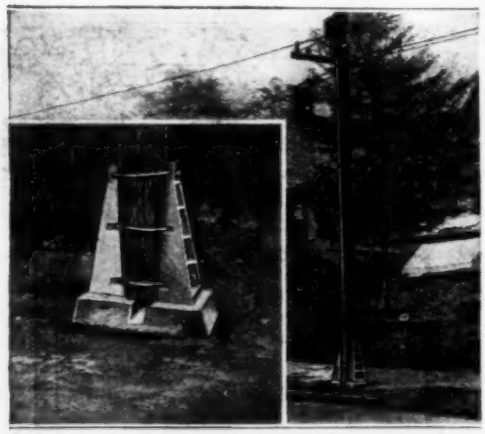
O-O-O

WITH pruning-hook and hedge shears, landscape gardeners have changed the dwarf firs planted by Cortes, the conqueror, near Mexico City, into carved figures, arcades, bridged pillars, and columns of foliage that rival the sculptured beauty of granite or marble. The dense covering of the evergreens has lent itself admirably to the purposes of the artist, and, with a precision almost mathematical, the interlacing branches of whole rows of trees have been transformed into veritable crossbeams of jade, that run the entire length of the park and seem to be supported by the tree trunks whose emerald tracery has also taken on the same form and dimensions, making them resemble giant green pillars. Farther along is a perfect line of arches forming a connected whole and resembling an old Roman aqueduct, in everything except height, and, in the near distance, stands a long file of inverted evergreen hearts reaching toward the sky.

O-O-O

CONCRETE POLE BASE CUTS REPLACEMENT COSTS

In view of the fact that telegraph poles generally begin to rot at the ground line, a concrete base has been designed to



Pole Base of Concrete with Metal Grips that Are Tightened with Strap Bolts

lengthen the life of the wood and reduce the cost of replacement. Where this foundation is used, no allowance for extension of the pole into the earth need be made, as the "mount" rises above the surface of the ground. Two metal fixtures firmly bolted to the base, support the pole, which has been tapered to fit the socket made by three strap-bolts passing through these supports.

ANCIENT LIFE SHOWN BY BONES OF MAN AND MAMMAL

Fossil remains of what appears to be the skull of the first type of mammal that existed on the earth more than 4,000,000 years ago, are reported to have been discovered in Kansas. Three skeletons of persons thought to have lived in the quaternary epoch, were found in France, and a skull, believed to be that of one of the first Indians to arrive on the American continent, was lately exhumed by scientists in California. The three skeletons were those of two men and a woman believed to have lived 15,000 years ago, and the first human remains of that particular age in the epoch ever unearthed. Of fine physical development, they were evidently of a race of hunters and fighters. One of the men apparently had been killed in battle, as a piece of flint was imbedded in his skull. Rude slabs of stone above the bones indicated burial rites performed.

STREET SWEEPER HAS WING TO CLEAN GUTTERS

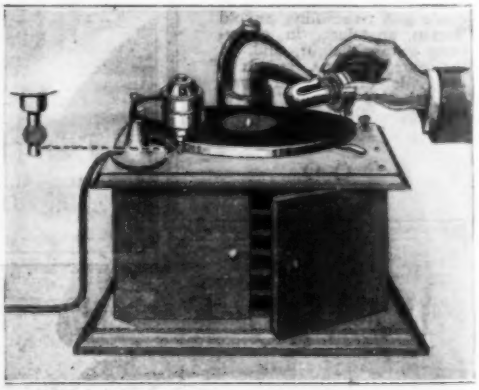
Leaves that collect in the gutters of paved streets are cleared away by an attachment at the side of a sweeper used in a mid-western city. Whether the debris is wet or dry, the device, which has weights to hold it close to the curb, throws the rubbish into the path of revolving brushes by which it is tossed into a box at the rear of the cart. The collection is then dropped in piles to be gathered up and hauled away.

CORK EXPANDS WITH AIR PRESSURE IN BOTTLE

Designed to prevent the evaporation of perfumes and other volatile liquids, a new form of cork has been patented by a French inventor. It has a cone-shaped hole extending inside about half way to the top, and is so fashioned that if pressure arises within the bottle, the stopper is expanded and held more firmly in place.

MOTOR OF ELECTRIC FAN RUNS PHONOGRAPH

Electric-fan motors may be utilized to operate phonographs. By removing the blades from the shaft of the fan, and fastening the base to the top of the talking machine, the motor may be tilted downward until the shaft touches the edge of



Electric Fan Motor Adjusted to Run Phonograph by Friction on Edge of Turntable

the turntable. The end can be transformed into a friction wheel by wrapping it with thread to give it a grip on the metal surface of the disk. The velocity of the phonograph may be regulated either by the thickness of cord or by the speed of the motor.

PLATING OF ALUMINUM NOW DONE WITH AID OF ZINC

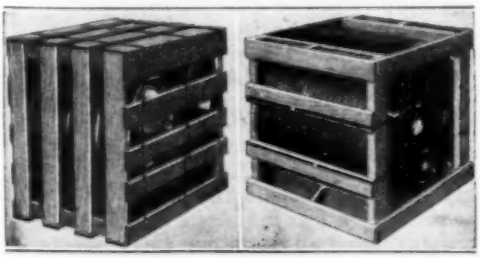
Difficulties encountered in plating aluminum with copper, gold, silver, or other precious metals are believed to have been solved by a recently discovered process. The chief trouble had been that an invisible film forms on the aluminum when it is exposed to the air. By the new method, this is dissolved in a bath containing soluble fluorides, a little hydrofluoric acid appearing to act the best. A coating of zinc is added to the aluminum in the plating bath. To form a gold surface, the layer of zinc must be coated thinly with copper, otherwise the precious metal will sink into the zinc and almost entirely disappear.

PACIFIC LINER STRIKES SEA OF JELLYFISH

Great masses of jellyfish, ranging in colors from black to white, were lately encountered off the California coast by an ocean liner. The steamer, according to the report given, plowed its way through this sea of jelly, which was visible near the surface of the water until the ship was well into harbor. It was surmised that the seismic disturbances in the western Pacific caused the creatures to migrate.

COUNCIL OF EXPERTS BUILDS MODEL SHIPPING CRATE

For shipping heavy pieces of machinery, government experts have designed an improved wooden crate, which is said to be much stronger than the ordinary type, although its construction requires less lumber. It weighs five per cent less than the old form, occupies smaller space, and needs but two-thirds as much banding. In



Shipping Crate Made by Experts to Save Lumber and Give Greater Strength

a laboratory trial the new pattern withstood 100 drops in a testing apparatus. The older one collapsed in the first fall.

WHEN OIL FAILS, AUTO STOPS, AS PUMP CONTROLS GAS

By combining an oil-circulating and vacuum fuel-feeding system for automobiles, the supply of gasoline is cut off

Vacuum Tank that Is Operated Directly from the Oil Pump Instead of the Intake Manifold

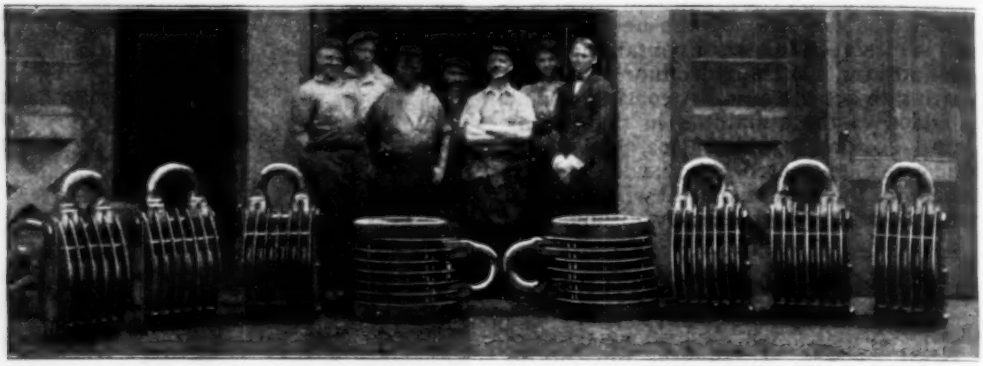
and the car stops whenever the lubrication fails, thus warning the driver and preventing costly repair bills. The fuel is drawn from the rear tank to one on the dash by vacuum from the oil pump instead of the intake manifold. It follows, therefore, that a motor which is not getting oil will not get gasoline. It is claimed that the device results in less crankcase dilution and fewer repairs. Its single valve may be seated with a few turns from the fingers.

PEARLS FORMED IN OYSTERS LEFT IN LIME SOLUTION

Minute pearls, supposedly formed from larger ones which were inserted into oysters, were reported found by a Japanese scientist after he had immersed the oysters in a solution containing a high percentage of an organic lime compound and allowed them to remain there several weeks. Two or three pearls, in addition to the original gem, were discovered, though they were too small to be of any commercial value.

TACKLE BLOCKS MADE BY HAND MOVE GIRDERS

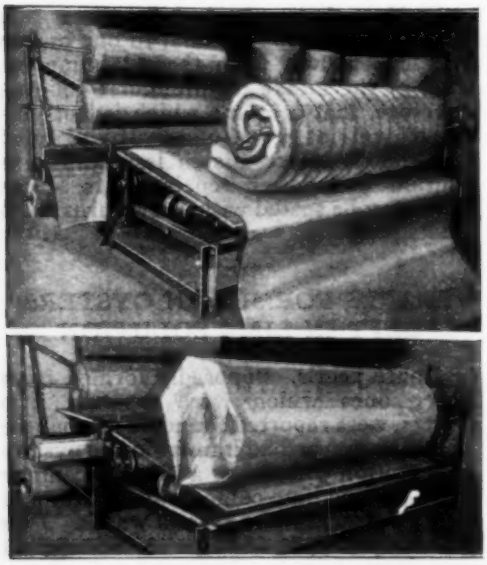
Handmade tackle blocks, each weighing about 800 pounds, for use in handling 68-ton steel girders and swinging them into place, were necessary in the erection of a 32-story office building in a mid-western city recently. So exacting were the requirements of the task, that high skill was necessary in the construction of the devices needed to sustain the heavy loads while being raised and lowered into position. The edges of the plates on the big pulleys were ground to prevent injury to the cable.



Giant Tackle Blocks Made by Hand to Move Huge Steel Girders Used in the Construction of a Thirty-Two Story Office Building

MACHINE PACKS MATTRESSES, WRAPS THEM IN PAPER

Hand labor is replaced and a saving in materials results through the use of a wrapping machine for mattresses, which rolls the bulky articles in a tight bundle and cuts the paper to cover them. As many as 500 a day can be finished by the apparatus, which requires the attention of only one man to operate it. The package produced is said to be dustproof, and so made that less space is required to accommodate it, thus reducing shipping and storing costs.



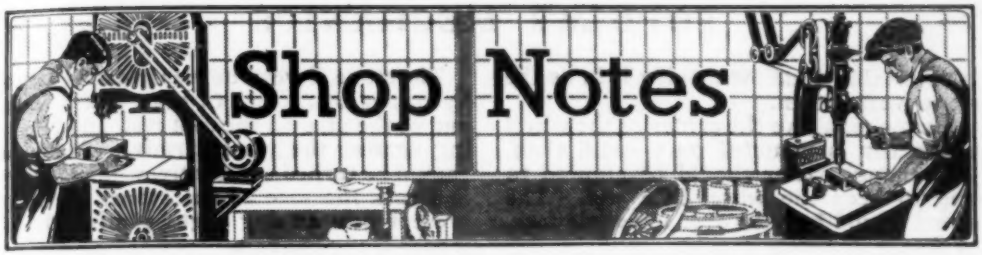
Machine that Replaces Hand Labor in the Packing and Wrapping of Mattresses

FOLDING CHAIRS FIND FAVOR IN ARAB MARKET

Sudden demand for folding chairs has arisen in Arabian markets, according to the report of an American consul, and has caused some surprise because the Bedouins are accustomed to sitting cross-legged on the ground or on cushions. Two thousand of these folding seats were lately imported from Austria, and local carpenters are reported to be manufacturing others to compete with the foreign product.

CLOTHING IS MADE FIREPROOF BY USE OF CHEMICAL

For the protection against burns and matches and bonfires, children's clothing can be made practically fireproof if it is soaked for a few moments in a solution of ammonium phosphate. The substance coats the fabric with a resisting film which is effective until the garments are washed again. Lace curtains and Christmas trees may be treated in like manner or dipped in a strong solution of alum water with equally good results.



All Shop Notes published in 1923, in book form—Fifty Cents—from our Book Department

Mounting the Grindstone

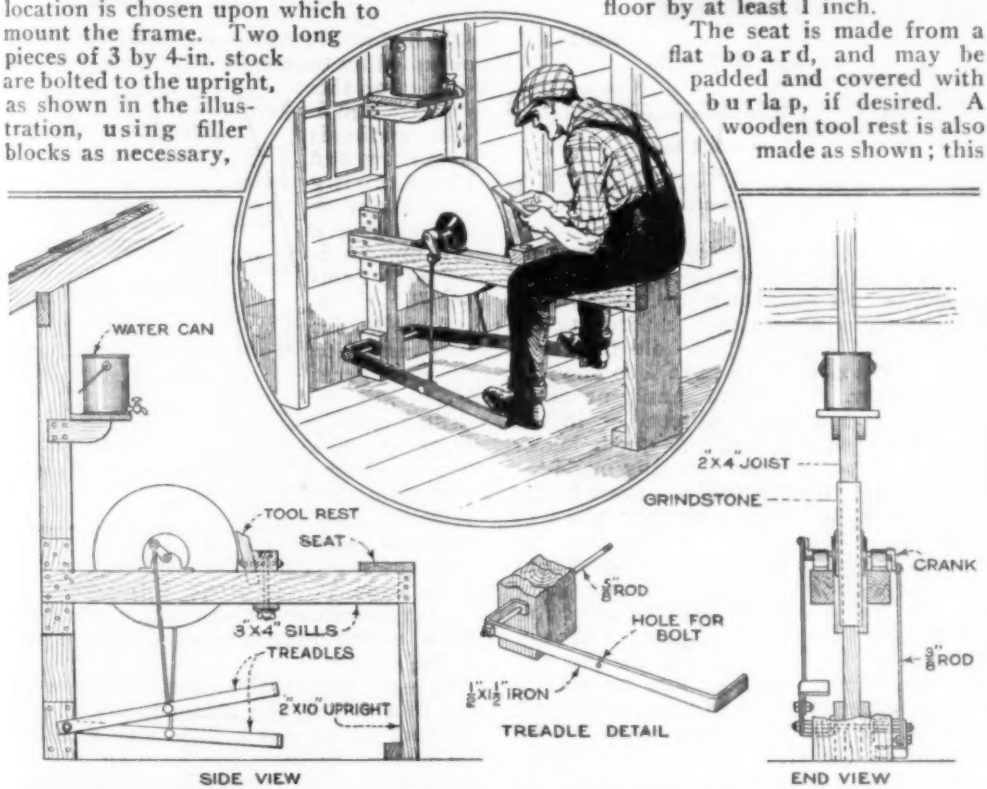
By J. V. ROMIG

GRINDSTONES of various diameters and widths may be purchased complete with the necessary bearings and spindle, ready to mount in a suitable frame, at a price much less than that of a mounted stone, and, as "store" mountings are not always satisfactory, many prefer to purchase only the stone and build a frame to suit it. For the farm or home workshop, a substantial wooden frame which provides a seat for the operator, is recommended.

A post or a wall upright in a convenient location is chosen upon which to mount the frame. Two long pieces of 3 by 4-in. stock are bolted to the upright, as shown in the illustration, using filler blocks as necessary, to space the sills the proper distance apart for the grindstone bearings. A 2 by 10-in. upright is then fastened to the floor, between the ends of the sills, and jointed to the latter.

The treadles are made of flat iron, bent and drilled as shown in the detail drawing, and pivoted on a ⅝-in. rod run through the post. The end of each treadle is bent at right angles to serve as a foot rest, and the treadles are connected to the cranks by ⅜-in. iron rods with eyes at each end. The treadles, when down, should clear the floor by at least 1 inch.

The seat is made from a flat board, and may be padded and covered with burlap, if desired. A wooden tool rest is also made as shown; this



A Very Substantial and Satisfactory Frame for the Farm and Small-Workshop Grindstone, and One that Will Appeal to the Man Who Likes to Make His Own Equipment

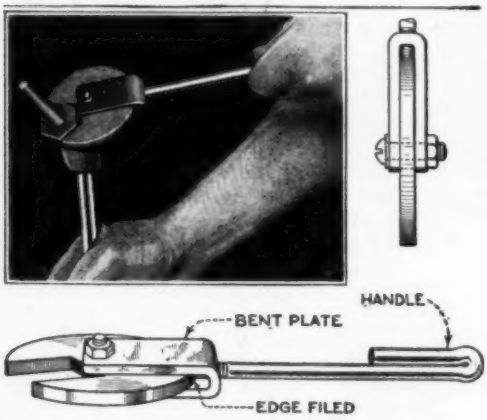
is adjustable, to allow moving it in as the stone wears down.

Six inches above the center of the wheel a drip can is mounted on a small shelf. Just enough water should be allowed to drip to keep the wheel face wet. The wheel should be used over its whole face, so that it will wear evenly.

The stone, if worn unevenly, can be trued by means of a piece of pipe, resting one end of the pipe on the tool rest, and pressing against the wheel firmly. The pipe should be turned constantly, while moving it across the face of the stone, so as to present new cutting edges continually as it rolls along the rest.

Wrench for Welding Torches

Users of acetylene torches know how easily the torches can be damaged by rough usage. One of the most frequent



Insert, Loosening Torch-Tip Nut; Below, Details of Wrench Construction

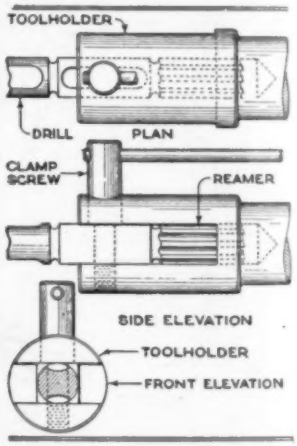
causes of trouble is the nut used to hold the various tips. When tightening or loosening this nut, the wrench should be held at right angles to the torch tubes, otherwise it is difficult to hold the torch at all, as the effect is to push it to one side or the other. The torch should never be placed between heavy objects or in the vise to loosen the nut. A much better method is to use a tool specially made for the purpose. Such a tool is shown in the photo; it consists of a circular piece of steel plate, cut out to fit the nut. A strip of the same material is doubled and attached to the circular piece with a screw and nut, and a handle made of steel rod and threaded into the bent piece as shown. In use the wrench is placed on the nut with the handle loose so that no matter what position the flats of the nut happen to be in, the handle of the wrench can be brought to the right position and tightened. The screw hole is slightly off center, so that the harder the handle is pulled, the harder it presses against the cross-filed edge of the disk.

Hot-Weather Comfort for Autos

An automobile top, exposed to the sun's rays, absorbs an amount of heat that renders it rather uncomfortable for the occupants, especially during the summer time. Experience has shown that the application of a coat of aluminum paint to the under side reduces the absorption of heat to a great extent, and painting the outside with the same kind of paint helps still more. Practically one-half of the heat absorption can be prevented by applying aluminum paint to either inside or outside.

A Combined Drill and Reamer

When all the holes of a lathe turret are occupied by tools and still another tool is needed on the job, some combination is necessary, and the drawing shows how, in one instance, a drill and reamer were combined.



A toolholder was turned to fit the turret hole, and drilled at the front to take the combination drill and reamer, then slotted the width of the tool. The drill-reamer was made from square stock, left square at the center and slotted to take a clamping screw, which threads into the bottom part of the holder.

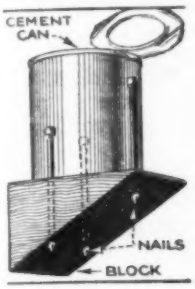
In using this combination tool the work was first drilled, the clamp loosened, and the tool pulled out a little way to allow the reamer to clear the locating hole in the holder. The reamer is swung around and the drill end pushed back into the holder, when the clamp screw is tightened and the next operation performed.

Tightening Barrel Spigots

Wooden spigots of the kind used on cider and vinegar barrels are apt to leak after being used for some time, due to the cork lining becoming compressed. It can be expanded to make the spigot tight again, by taking out the plug, and holding a burning match under the spigot body, so that the flame will char the cork slightly.

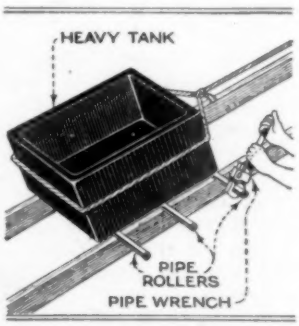
Roofing-Cement Holder

It is very inconvenient to be obliged to hold a cement can while working on a roof, and for this reason the holder shown in the illustration should appeal to all who must do such work. It consists of a wooden block, with one side cut to correspond to the angle of the roof and three nails driven through it as shown, the pointed ends projecting just far enough to catch the roofing paper and prevent the block from sliding. The upper ends of the nails keep the can from sliding off the block.—John A. Blaker, West Auburn, Mass.



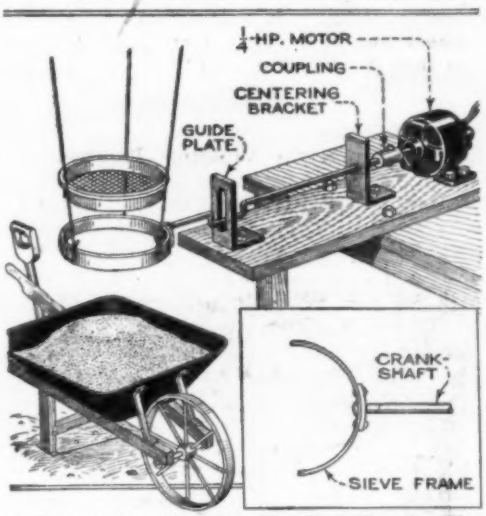
Moving Tank on Runway

When moving a heavy iron tank up a wooden runway by means of a block and tackle, using lengths of iron pipe for rollers, it was found that the rollers were forced slightly into the wood, due to the weight on them, and this caused them to stop turning. Increasing the pull on the tackle did not help, but merely caused the tank to slip over the rollers. One of the men obtained two pipe wrenches and applied them to the front and rear rollers in the same manner shown in the drawing. Turning the wrenches caused the rollers to turn while the load was being pulled up and also exerted an additional force in moving the load.



Motor-Driven Sieve for Foundry

In foundries and elsewhere a considerable saving of labor and time can be effected by using a motor-driven sieve of the kind shown in the drawing. The sieve is held by a ring suspended from the ceiling on three cables, to prevent it from upsetting and to permit some lateral motion. The shaft that actuates the sieve fits loosely in the side of the ring, the hole being reinforced by a small piece of sheet metal, riveted on and drilled for the shaft to fit loosely. The other end of the shaft is coupled to the motor, as shown. Two brackets made of steel plate are used to support the shaft and to serve as bearings; the one nearest the sieve has a vertical slot a trifle wider than the diameter of the shaft cut through it so that the shaft, which is bent to form a crank at this point, will oscillate at this end when rotated. The other support is simply drilled to a neat fit for the shaft. The size of the motor to use for this purpose, of course, depends on the size of the sieve; for small sieves a ¼-hp. motor has been found large enough. In use, the operator places a wheelbarrow or other container under the sieve and then shovels the sand into it. Besides being useful for sand, it can be used for sifting grain, ashes, and other materials.

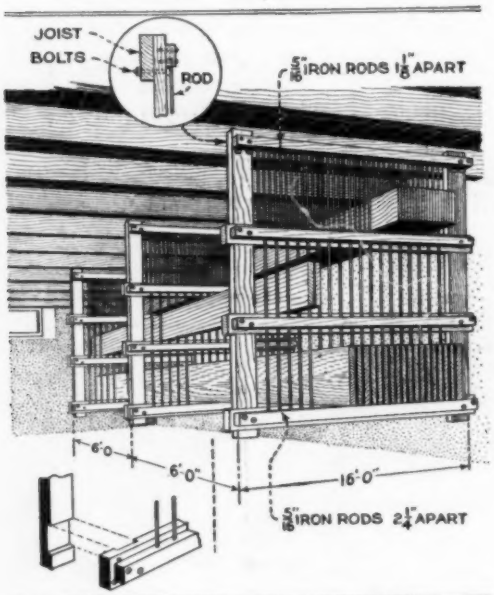


A Motor-Driven Sieve that Has Been Found a Time and Labor Saver

¶To keep milling cutters from slipping on the arbor, put writing-paper washers between the steel washers and the cutters. Very thin copper or brass washers can also be used.

A Substantial Lumber Rack

The lumber rack shown in the illustration has some excellent features, and



A Novel and Substantial Lumber-Drying Rack for the Woodworking Shop

should prove a valuable addition to any woodworking shop.

There are three frames, ends and center. Each frame consists of two upright pieces bolted to the floor joists, and four crosspieces, half-checked and screwed to the uprights. The novel feature lies in the separators used in the frame. In building a lumber rack, it is common practice to use stock about ⅞ in. thick by 1 or 1¼ in. wide; these not only waste valuable space, but are easily broken. In this rack, ⅝ in. iron rods are used, held in strips screwed to the crosspieces of the frame. In the two center strips, ⅜-in. holes are bored right through, spaced 2¼ in. between the rods. In the bottom strip these holes are spaced the same, but are ¾ in. deep only. In the second strip from the top, ¾-in. deep holes are bored between the through holes, and in the top strip the holes are spaced 1⅛ in. apart, and bored through.

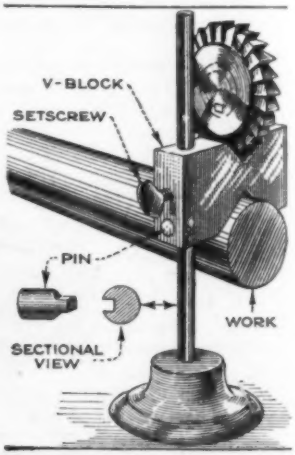
Thin stock, ½, ⅜, ¾ in. thick, etc., is stored in the upper rack, and the heavier stock in the lower ones. If it is necessary to remove one or more rods, to store very thick stock, or to replace bent rods, it is only necessary to raise the rod out of the bottom hole, draw it out enough to clear the strip, and pull it out. Putting in new rods only means reversing the operations. The rods, of course, are cut to such a length that they can be raised enough to clear the bottom strips.—M. E. Duggan, Kenosha, Wis.

Replacing Wire-Wheel Rims

Repairmen who occasionally have to replace a bicycle rim, know how puzzling it is to put the spokes into the new rim correctly. This difficulty can easily be overcome by securely tying every pair of spokes together at the point where they cross, which will hold them in position until they have been attached to the new rim. A good method of doing this is to twist a short length of iron wire around them with a pair of pliers. If it is necessary to replace any of the spokes, this should be done after they are in place on the new rim, in order to avoid making mistakes.

Centering Round Work on Milling Machine

It is a slow and tedious task to find the center of a shaft when cutting a keyway or other groove in it. To eliminate this difficulty we made a center-finding tool of the kind shown in the drawing. It consists of an iron base, a vertical guide rod, with a keyway cut lengthwise as shown, and a centering block, which is drilled to fit the guide rod, and has a V-groove on each side. This block is provided with a pin, the end of which slides in the groove of the guide rod, and a setscrew to tighten the block on the rod at any point desired.



In use the block is raised and dropped onto the shaft, which automatically centers it, then the setscrew is tightened. The milling-machine table is then raised and moved until the cutter is in the center of the upper V-groove.—L. H. Moore, Toronto, Can.

Building a Blower for the Forge

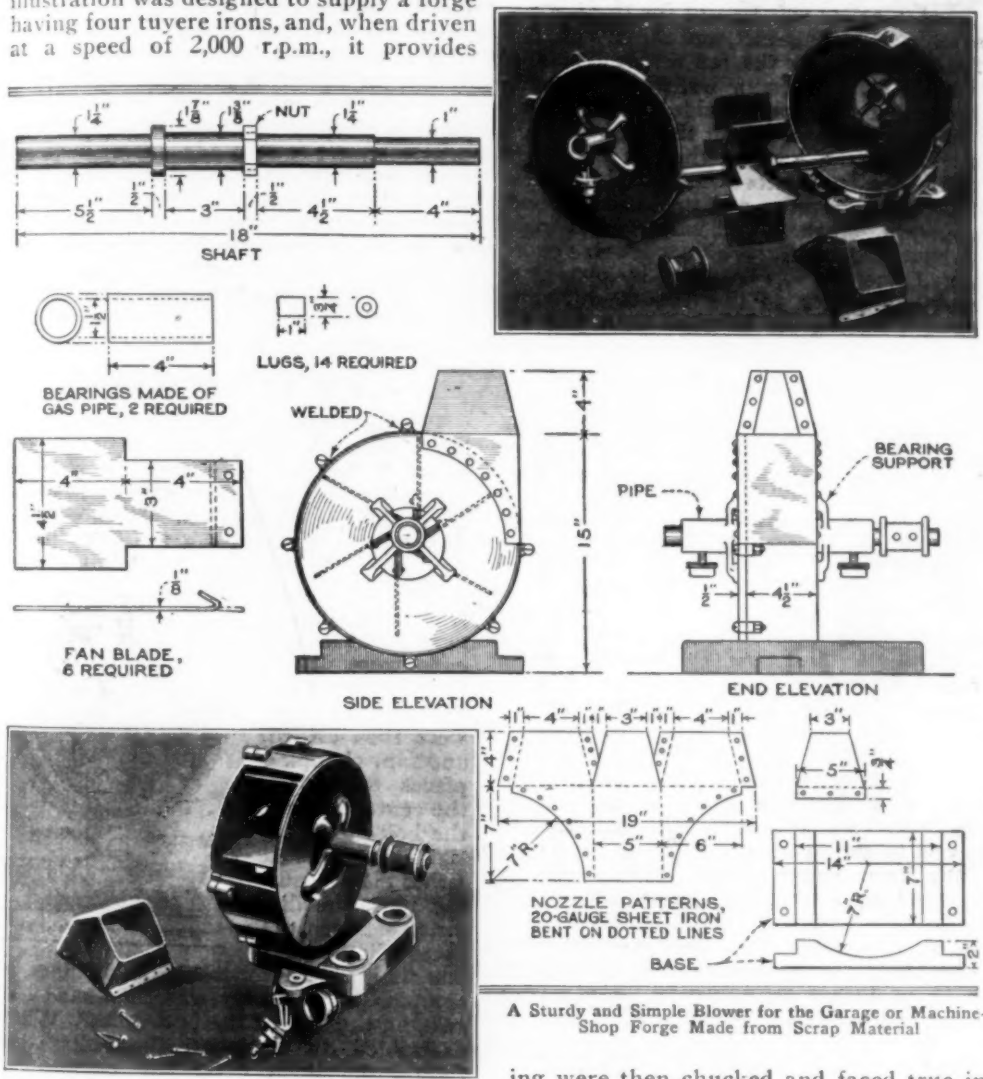
By RAY F. KUNS
Principal, Automobile Trade School, Cincinnati, O.

PRACTICALLY all machine shops and garages are equipped with some style of forge, often "knocked up" hastily from scrap material, but, while the making of the forge is quite simple, many mechanics are "stumped" when it comes to designing a blower.

The blower shown in the accompanying illustration was designed to supply a forge having four tuyere irons, and, when driven at a speed of 2,000 r.p.m., it provides enough pressure to operate all at the same time, when driven by a 1-hp. motor. The materials for its construction were found in the scrap heap.

Two 12 to 14-in. brake drums are required for the body or housing of the blower. In this case the drums were 14 in. in diameter by 4½ in. wide. One of the drums was chucked in the lathe, and the edge faced off until it was ½ in. wide. The points at which the lugs were to be attached were then marked on both drums, and the lugs turned, drilled, and welded in place, leaving generous fillets of filler material on each lug, as indicated in the side elevation. The separate parts of the housing were then chucked and faced true in the lathe, after which the half-lap joint was turned.

The boxes for the bearings were made of 1½-in. pipe, 4 in. long. Short lengths of ½-in. iron rod were shaped to fit against housing and boxes, for supports, and the supports welded to the boxes as shown. The base was made from an old cast-iron



A Sturdy and Simple Blower for the Garage or Machine-Shop Forge Made from Scrap Material

jig base; to provide a good seat for the housing the base was set up on the lathe carriage, and a fly cutter used to cut an arc of 7-in. radius in it. The housing was then hot-riveted to the base. A piece of hardwood may be used as a base if cast-iron is not available.

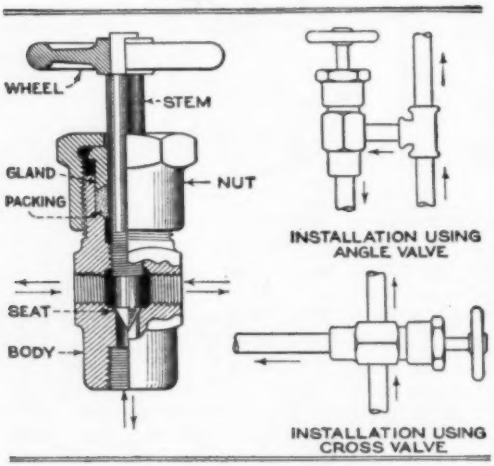
The shaft was made from an old automobile axle shaft, but, of course, machinery steel is quite as good. As may be noted, a collar was turned for the fan assembly to butt against, and threads chased for a nut to lock the fan assembly. The fan blades, six in number, were cut from ⅛-in. sheet steel, and welded to a built-up spider sleeve bored to fit the shaft. After mounting and locking the fan assembly on the shaft, the latter was placed between centers on the lathe, and the blades turned to insure that the lengths and widths were all equal. After all machine work was completed, the fan was balanced by placing a rivet or rivets in the blades rquiring weight, testing for balance on a pair of straightedges. The fan was made ¾ in. smaller in diameter than the housing.

The fan was then assembled with the bearings, and the latter placed so that the blade edges would just clear the point on the housing to which the upper edge of the nozzle is attached, the opening for the latter having previously been cut; the bearings were then welded to the housing, and babbitted, after all machine work was completed and the parts assembled. This insures the bearing being in alinement. The shaft should be heated and smoked before the babbitt is poured. Wick oilers, from attached oil cups, are used to lubricate the shaft.

The nozzle was made from 20-gauge sheet iron, cut to the pattern shown, in two sections, the sections riveted together, and the nozzle riveted to the housing. While the design shown was perfectly satisfactory, it may, of course, be changed to suit individual requirements, or if different materials are used.

Making and Using Cross Valves

A much neater and stronger pipe job can be done by using a cross valve than by using an ordinary angle valve, because

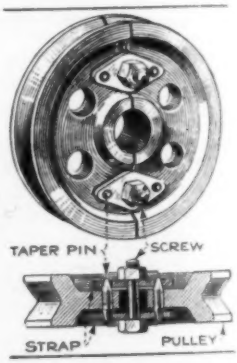


Left: An All-Steel Angle Valve for Use as a Cross Valve. Right: Comparative Installations

the tee and nipple, which must be used with the latter, are eliminated. A cross valve can readily be made by drilling and tapping the side of an all-steel needle-point angle valve, as indicated in the sectional view to the left in the illustration. The run of the valve is used in the main feed line, and when the valve is closed, the liquid flows in only one direction.—J. V. Romig, Allentown, Pa.

Clamping a Grooved Pulley

The novel pulley clamps shown in the illustration were successfully adopted when it became necessary to place a grooved pulley on a shaft already in place. To enable the pulley to be placed without disturbing the shaft the following work was done: First, four small holes were drilled as shown and pins slightly tapered at both ends were driven in place; two holes for bolts were then drilled, and four clamping pieces drilled in the center to clear the bolts used for tightening, and at either side to suit the pins, the distance between the holes being a little less than the center-to-center distance of the pins. The pulley was then sawed in two, on the line of the bolt holes. When assembled on the shaft the bolts were tightened, which drew the clamps together; the center distance of the holes being less than that of the pins, both sides of the pulley were drawn together, binding it securely on the shaft.



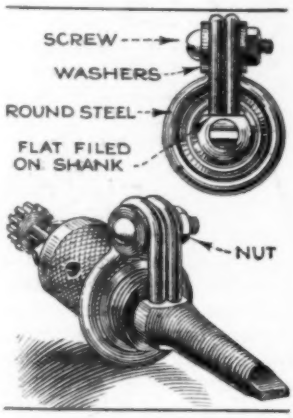
Oil the rocker arms on overhead-valve motors at least every two days. This takes only a moment and prevents wear.

Compressing Auto Springs

When installing snubbers on an automobile it is necessary to pull the strap as tight as possible, and this makes it necessary to compress the spring, which is impossible to do by hand or with a "C" clamp. The springs can be compressed without any difficulty by running the car in the garage doorway so that the middle of the spring is located directly under the door-frame header. The wheels are then blocked to make them stay in place and a length of 2 by 4-in. timber forced between the car frame and the header, directly over the axle, a piece of cloth being placed below the wood to prevent damage to the enamel. The wheel is then jacked up as far as necessary to attach the snubber snugly, making a nice tight job when the spring is released.—Rev. Philip Jonker, Peekskill, N.Y.

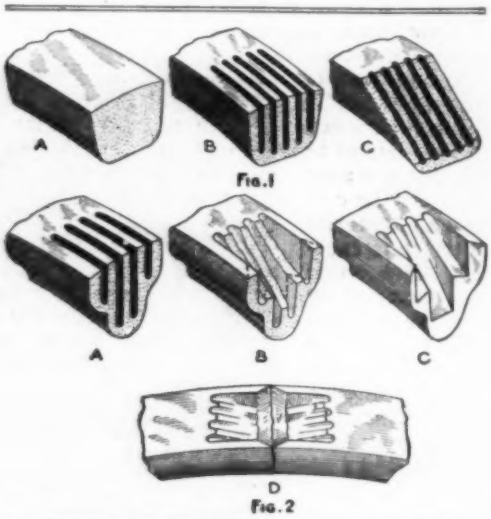
Locking Drill Chuck

The drawing shows an effective method of locking a drill chuck of the threaded-sleeve type. This chuck finds favor in many shops, as it is easily opened and closed by hand, but this very feature is a disadvantage if the chuck is run in the reverse direction. Small shops, which are compelled to utilize tools to the fullest capacity, often find it necessary to use a drill chuck in the milling machine for holding small shank end mills, etc., and in such cases the lock shown is very useful. It can be made in a few moments to suit any size chuck by bending a piece of round steel around the chuck sleeve and forming the ends so as to bear on a flat spot filed on the shank. In use, the chuck is first tightened on the cutter in the usual way, and the ends of the lock are then squeezed together by a nut and screw, locking the chuck sleeve securely. Left-hand cutters can be held firmly in this manner, whereas if the sleeve is not locked the action of the teeth in cutting will loosen the chuck by unscrewing the sleeve, and perhaps spoil the job or break the cutter.



Preparing Castings for Welding

Welding on some work is very difficult, because the piece to be welded is of such a form or the break is at such a point that it is almost impossible to clamp it tightly in a vise for beveling, to provide a scarf for the weld, without danger of further breakage by pressure.



Improved Method of Doing a Good Job of Welding on Small, Irregularly Shaped Pieces

A good method of handling such a job, if the piece is of the general form shown at A in Fig. 1, is to clamp the work lightly in a vise and then make a series of parallel cuts with a hacksaw, as shown in B. The cuts are made almost to the bottom edge and at an angle which will make sufficient clearance for the welding operations to follow. The end is then beveled as shown in C, breaking off the sections by the wedging action of a thin-bladed cold chisel. In case the piece to be welded is of a more irregular contour, as shown in Fig. 2, the saw cuts are made of a depth proportional to the thickness of the material, as shown in A, and cut out as in B. The end is then beveled, as shown in C, by means of a file or emery wheel. When both sides of the break are prepared in this way, they are set together as indicated in D, and a good weld can easily be made.—C. R. Van Druff, McLouth, Kan.

¶Grease or vaseline, rubbed on the hands before starting on a dirty job, will keep the dirt out of the pores, and enable the hands to be cleaned much more easily afterward.

Resurfacing Worn Street Pavements

Worn-out pavements with large "potholes" may be transformed into first-class boulevards by resurfacing with sheet asphalt. Recent developments in paving practice have shown that this can be done whenever the original base is in good condition, no matter how irregular the surface may be, or from what material it is constructed. The work of resurfacing can be accomplished in a few days without seriously inconveniencing traffic, as only half of the street need be surfaced at a time, leaving the other half open to traffic, whereas, when making a new pavement, traffic must be stopped until the concrete base has had time to set properly.

Above, Dumping the Heated Sheet Asphalt; Below, Spreading Pure Asphalt over the Old Pavement

The area to be resurfaced is first thoroughly cleaned of all foreign matter by sweeping with rotary sweepers or hand brooms. The larger "potholes" are filled with concrete, defective gutters are rebuilt, and loose bricks are either relaid or replaced with concrete. The surface is then sprinkled with pure asphalt, heated to a temperature of about 300° F. This seems to produce a more effective bond between the sheet asphalt and the original surface than can be obtained if the sheet is laid directly on the old pavement. The sheet asphalt is then brought from the plant, at a temperature a little higher than 300° F., dumped just ahead of the part already laid, shoveled into place with heated shovels, and raked to a uniform surface with heated iron rakes. It is then tamped, sprinkled with limestone dust, and thoroughly compressed by rolling with a 15-ton roller. After rolling, squares are cut out around valve boxes, manhole covers, etc., the castings raised to the new grade and reset in concrete, and asphalt laid around them. The asphalt layer is allowed to thin out to a feather edge at the gutter, so as to avoid building a new gutter.

In Dayton, Ohio, some streets resurfaced in this way with layers averaging about ½ in. in thickness, have given satisfactory service for two years, with no indication of the asphalt pulling loose from the surface. The resurfacing cost 49 cents per square yard.—Ivan E. Houk, City Engineer, Dayton, Ohio.

Wood Preservatives

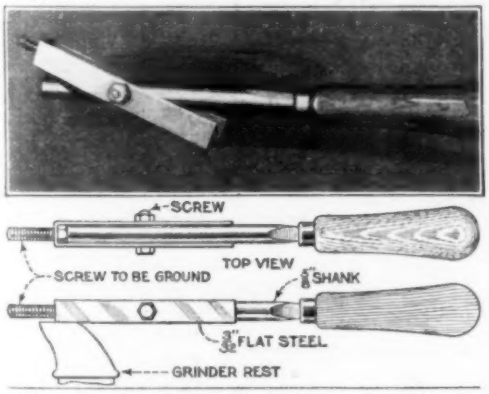
During the last 10 years it has been proved by tests performed by the U. S. Bureau of Agriculture that coal-tar creosotes are more effective in protecting wood against boring insects such as "white ants," and Lyctus-powder post beetles, than any other wood preservative known. Wood, impregnated with the creosote under considerable pressure, has been found to last for at least 25 years. The open-tank method of creosoting wood, if carefully done so that good penetration is obtained, will render the wood resistant for at least 15 years. On farms where it is impossible to use this method on the wood of buildings already erected, or on fence posts, the best method is to apply several coats of creosote with an ordinary paint brush or spray; this will add from 2 to 5 years to the life of the wood, providing it is not too old when the creosote is applied. By adding pigments to the oil a very neat and presentable appearance will be given to the wood.

Interior woodwork should be treated with zinc chloride, bichloride of mercury, sodium fluoride, or chlorinated napthalene. Mercuric chloride is very poisonous, and, as it has a tendency to come off in small quantities, should not be used. Lumber, implement handles, wagons, etc., that cannot be treated with coal-tar creosote, for various reasons, should be stored in creosoted sheds.

Grinding Screw Ends

Sometimes screws of standard sizes are just a few threads too long for some particular job, and this makes it necessary to grind down the ends. If any number of screws of the same size must be ground down in this way, a simple holder of the type shown in the illustration will be found of considerable assistance, as, with it, the grinding can be accomplished without the necessity of frequent dipping in water to keep the screw cool.

The shank or body of the tool is a short length of 5/8-in. machine-steel rod, pointed at one end so that it can be driven into a wooden handle, and a piece of 3/32-in. flat steel about 5/8 in. wide, bent as shown and drilled through the center to receive a



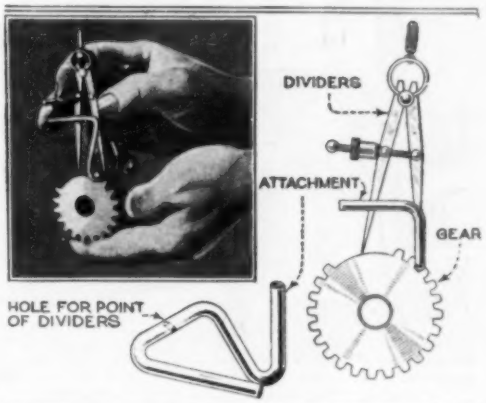
Simple but Effective Tool for Grinding Small Screws Rapidly

small screw, with which it is attached to the shank. The end of the flat piece is drilled to suit the diameter of the screw to be held, just enough space being allowed between the end of the shank and the screw heads to hold the screws securely. With this holder the operator need not touch the hot screws at all as they drop out themselves when the tool is opened. In use, both parts of the tool are held together and steadied on the toolrest, as shown in the lower detail.—Harry Moore, Montreal, Can.

Divider Attachment Marks Gears

The divider attachment is well worth including in a repairman's kit for its usefulness when "pegging" gears.

When several teeth of a gear have been



Simple Attachment that Enables the Repairman to Space Pegs Correctly When Repairing Gears

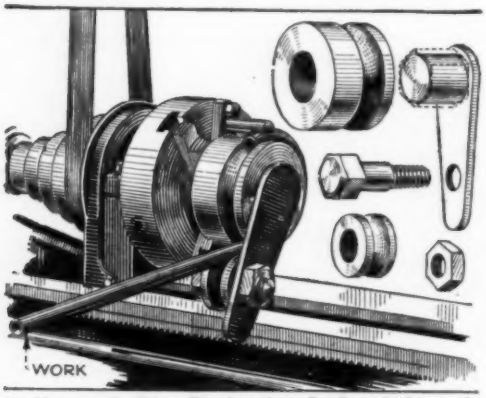
sheared off it is, of course, important to place the inserted pegs in the same position as the broken teeth, and it is for the purpose of marking the correct position that the attachment shown in the photo is used. It is made from a length of drill rod, bent to the shape indicated and drilled for the point of the dividers. The attachment and dividers are then assembled, the cross leg of the attachment set between two of the gear teeth, and the free point adjusted to the center of any convenient tooth. It is not necessary to open the dividers enough to span the complete gap in the gear teeth; about half the distance will do, as the dividers are used from each side of the gap. After filing or grinding off the remnants of the broken teeth, the surface is blued and the attachment moved across the tooth with the free point of the dividers touching the blued surface. The same process is repeated in the next tooth space and so on until the position of each missing tooth has been marked.

It will be seen that the dividers are held securely at right angles to the axis of the gear, so that the lines marked will run straight across, besides preserving the correct pitch. If the lines are followed closely in drilling, it will be found that no trouble will develop from "off-pitch" pegs.

¶Celluloid triangles may be written upon with anhydrous acetic acid. This may be colored to contrast with the celluloid.

Homemade Pipe Bender

In a Kansas shop, where it was necessary to turn out a number of short lengths of 1-in. pipe, bent at one end to a half circle, having a radius of 6 in., all attempts to do this by heating the pipe, packing it with sand and then bending, and by numerous other methods, were entirely unsatisfactory.



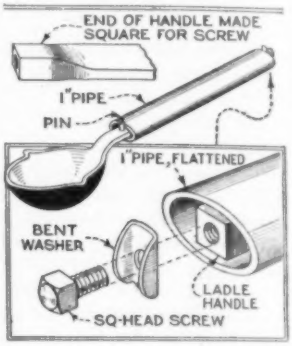
A Homemade Pipe Bender that Is Attached on the Lathe, Has Been Found Very Efficient

One of the mechanics then decided to make a bender that would do the work. In looking for material to make it, he was fortunate to find a cylindrical casting of about the right diameter. This he chucked on the lathe, reduced it to the proper diameter and grooved it to fit the 1-in. pipe as shown in the drawing. It was then drilled out so that the side extension of an old discarded socket wrench would fit into it when the hexagon was turned as shown by the dotted lines. A small roller, also grooved to fit the pipe, was attached to the handle of the wrench extension with a shouldered bolt, and a stop was bolted to the chuck face. A length of pipe was run between the roller and the casting and between the stop and the casting, the stop being behind the roller when the handle rested on the ways of the lathe. The lathe was then revolved slightly more than a half revolution, so that the pipe would spring back to a half circle when the tension was removed. This bender made almost perfect bends without denting or flattening the pipe in the least.—Earl Pagett, Independence, Kan.

¶ The arc of contact of a grinding wheel on the work has a very important bearing on the grade of wheel required. The smaller the arc, the harder the wheel should be, and vice versa.

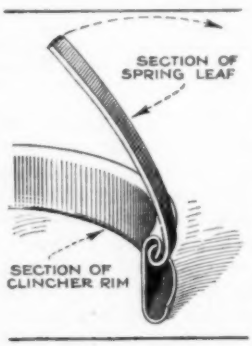
Removable Grip for Babbitt Ladle

When babbitt is melted in an ordinary gas furnace the ladle handle is almost sure to get too hot to be comfortable, and it is the customary practice to cover the handle with a bunch of waste to protect the hands. This is not satisfactory, because thick waste makes the handling of the ladle difficult and the waste often begins to smolder and burn. In one shop, a removable grip for the handle was made that proved very satisfactory in use, and eliminated all trouble. A hole was drilled through the handle near the pot and a pin driven through, as shown in the drawing. The handle was then heated at the end and upset enough to enable it to be drilled and tapped for a capscrew. A length of iron pipe, slightly flattened, served as the grip, and was held on the handle by means of a screw and a ound washer, both sides of the latter being turned up so that it would slip inside the pipe. The ladle is placed in the furnace with the grip off, and, when the metal is ready to pour, the grip is slipped on up to the pin, and the screw and washer in the end given a quarter turn.



Straightening Auto Rims

Dents in clincher rims can be removed very easily by means of the simple tool illustrated. It is merely half of a leaf spring with the shackle eye at the end. A tapered punch is used to spread out the eye to ½ in. in diameter, and the end is then cut off with a hacksaw to form a hook that can be placed under the bent edges of the rim. The dent is readily straightened by pulling the tool in the direction indicated by the arrow.—Fred Bargiband, Pittsburgh, Pa.



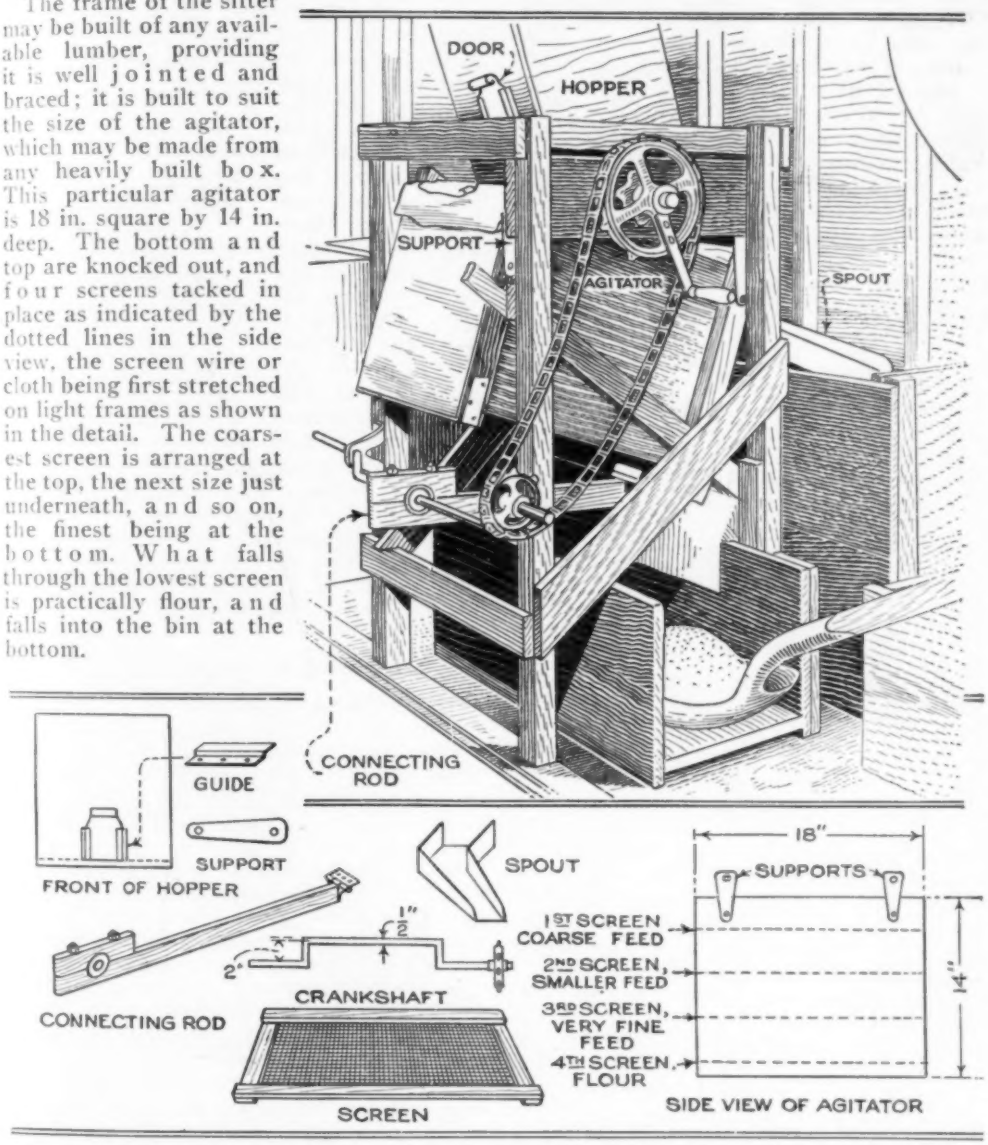
A Novel Ground-Feed Sifter

By DALE R. VAN HORN

A NEBRASKA poultry raiser has designed and built a novel ground-feed sifter and grader, with which he is able to separate any ground feed into four groups, graded according to the size of the particles, in one operation. Since all of the parts are such as may be picked up around the farm, making the cost negligible, a sifter of this kind will prove of value to every poultry raiser.

The frame of the sifter may be built of any available lumber, providing it is well jointed and braced; it is built to suit the size of the agitator, which may be made from any heavily built box. This particular agitator is 18 in. square by 14 in. deep. The bottom and top are knocked out, and four screens tacked in place as indicated by the dotted lines in the side view, the screen wire or cloth being first stretched on light frames as shown in the detail. The coarsest screen is arranged at the top, the next size just underneath, and so on, the finest being at the bottom. What falls through the lowest screen is practically flour, and falls into the bin at the bottom.

The agitator is hung in the frame at an angle, as shown, by means of four heavy sheet-metal supports, which are pivoted rather loosely on heavy screws at both ends. Hinged to the bottom edge of the back side of the agitator is a wooden connecting rod or pitman, which shakes the agitator back and forth. The connecting rod is split at the outer end to take a split bushing that rides on the crank. The



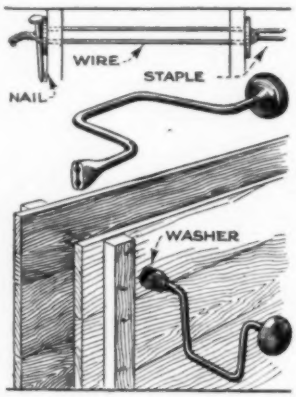
Above, Front View of Sifter, Showing Operating Mechanism; Below, Details of Construction of the Various Parts

crankshaft is made of ½-in. iron rod, as shown in the detail; it has a 3-in. sprocket keyed to one end, and runs in flat-iron bearings bolted to the frame. The crankshaft is driven by means of a chain, from a 7-in. hand-crank operated sprocket mounted on a stud attached to one of the upper frame members. The crank has a 2-in. offset, giving the agitator a motion of 4 inches.

A hopper, tilted in the opposite direction to the agitator, is firmly fastened to the top of the frame, to contain the unsifted feed. The flow to the agitator is controlled by a sheet-iron door, sliding in guides nailed at the sides of the opening.

Tightening Concrete Forms

Concrete forms for walls are usually tightened by means of lengths of wire, which are doubled, run through the sides of the forms at regular intervals, and twisted in the center by means of a stick. This method of tightening the wire necessitates working within the forms, which is very often difficult. A better method, which allows the wire to be tightened outside of the form, is shown in the illustration. The chuck end of an old brace is flattened at one end, and two holes, slightly larger than an ordinary fence staple, are drilled as shown. The end is then slotted with a hacksaw as indicated and closed slightly to create a slight spring.

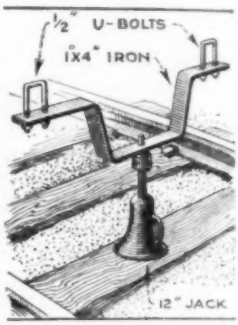


As the forms are erected the wires are passed through the holes drilled for them, a staple with a washer under it being hooked under the doubled end. The two free ends are twisted together and a nail inserted under them, a washer being provided under the nail to prevent the nail from being sunk into the form. To tighten the wires, the brace is slipped onto the staple and is then turned to twist the wire to the desired tension. The forms can later be removed by simply slipping the staple out of the wire and the washers will not be damaged. The holes in the staple side of the forms, of course, are large enough to take the doubled wire.

Frequently a solid tire run out of line will develop lumps or an uneven tread. To remedy this, take the tire to any pneumatic-tire store and have the rubber buffed.

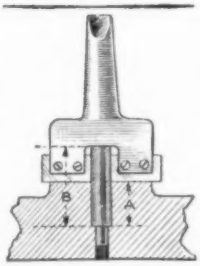
Turning Gasoline Car on Track

Turning a gasoline-propelled car around on railroad tracks can be accomplished easily and quickly by means of the device shown in the drawing. It consists of a 12-in. jack and a piece of 1 by 4-in. iron bar, bent to the shape shown and fastened to the frame of the car, in the center, with U-bolts. A hole is drilled in the bottom of the attachment to fit the top of the jack. Screwing up the jack lifts the car, and as soon as it clears the tracks sufficiently it can be swung around. This can be done by one man in two or three minutes. The bar, of course, is permanently attached to the car frame and the jack is always carried on the car.—L. W. Brown, Braeman, Tenn.



Facing Bosses to Gauge

In machining a large number of castings, the bosses of which had to be faced to an accurate dimension A, a simple gauge was made that greatly facilitated the operation, and prevented spoiled work. The facing tool used was of special form, as shown in the illustration, and a hardened-steel pin was used with it to serve as a gauge. The pin was of such a length that, with the tool seated on its top, the cutters had faced the boss to the correct height. Knowing that he could not spoil any work as long as the pin was in place, the operator made much better time than was possible by any other method.—J. H. Moore, Toronto, Can.

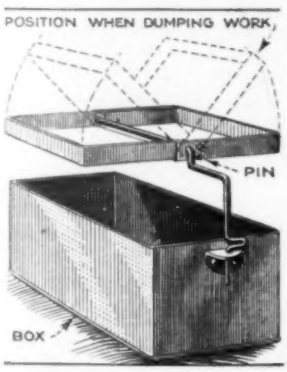


Curing Blowing Out of Gaskets

Some gasoline engines of the type having a detachable head are constantly blowing out gaskets. This usually occurs at the narrow points, as between the cylinder bores, or in the valve-chamber area, and is usually due to a slightly warped cylinder casting. A permanent remedy for this trouble is to cut two pieces of sheet copper, .005 in. thick, large enough to cover the place where the gasket blows out. One piece is placed below the gasket and the other above, and the head is then clamped down tightly. A new gasket must, of course, be used in making this repair.—G. C. Douglas, Raleigh, N. C.

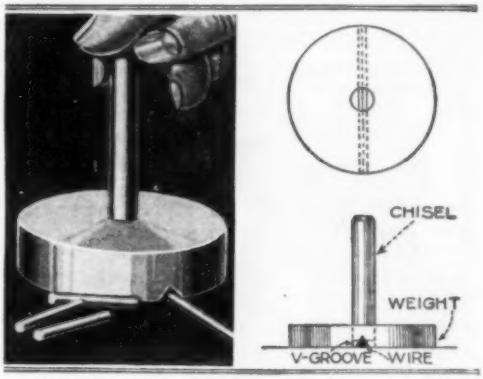
Pan Catches Automatic Screw-Machine Work

Most automatic screw machines are so tooled that one operator can attend to several, but allowance must be made for a certain amount of spoiled work, as the operator's time must be divided between the machines. In a factory where small wire goods are made, the pan shown in the illustration is used to prevent spoiled pieces from entering the box containing work passed as correct. The pan is made of sheet metal and consists of two pieces, made in the shape of half trays. One piece fits over the other as shown and has its sides extending beyond the bottom of the other a short distance so that there will be space for the work to pass through when both sides of the pan are lifted to the position indicated by the dotted lines. Both sides pivot on a length of steel rod, bent to the shape shown, and passed through the hole in the box handle. A pin is riveted to the outside of the larger pan, and rests against the rod holding the pans, so that the weight of the work, which drops on this side, will not cause the pan to tip over. The operator inspects the work in the pan, and, if it contains no spoiled pieces, the sides are lifted and the work slides into the box below. If it contains spoiled pieces the work is emptied into another box.



Cutting Wire Safely

Above a certain diameter, steel wire cannot be cut conveniently with ordinary pliers, and therefore a chisel is often used for the purpose. This method is rather dangerous, however, as the small pieces are likely to fly into the worker's face, and it is also somewhat inconvenient, as the pieces are apt to be lost. A better method of cutting the wire is to use a flat block of steel as shown, with a V-groove cut across the bottom, and a hole drilled through the center for a round-shank chisel. The wire is pushed along the groove and is cut off with the chisel.

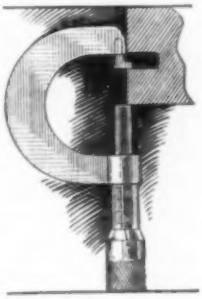


Left, Cutting Heavy Wire; Right, Details of Cutting Fixture

To cut the wire in equal lengths, it is either nicked with a file at the points to be cut and the wire then pushed along until the nick comes directly in the center of the hole, or a weight is placed on the block and a stop is provided on one side so that the wire can be pushed up against this and then cut off. Spring wire can be cut safely in this way without any danger.

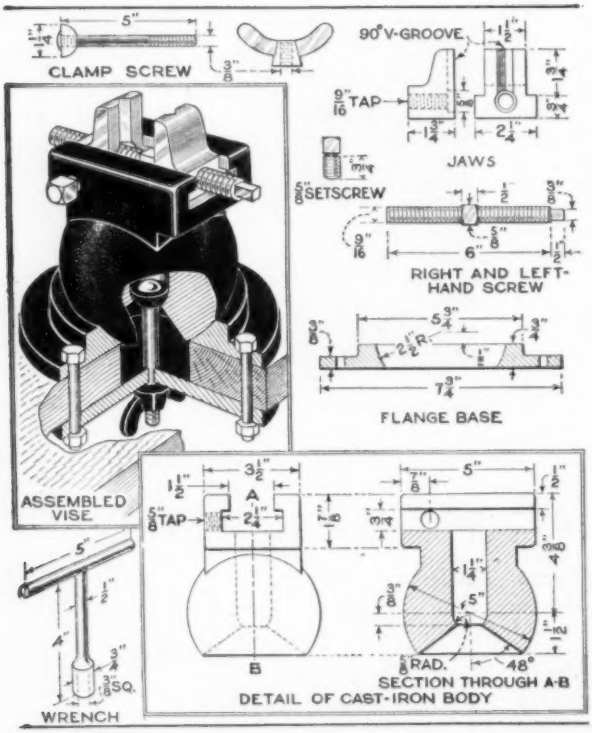
Adding to Usefulness of Micrometer

It is often necessary to take micrometer readings on work of the kind shown in the illustration. This is made possible by grinding down the head and part of the anvil about $\frac{1}{32}$ in. as shown, leaving a $\frac{1}{32}$-in. lip projecting. This will not affect the accuracy of the micrometer and will add considerably to its usefulness.—F. J. Haas, Milwaukee, Wis.



Bench Vise with Universal Base

Due to the limitations of the ordinary stationary vise, a workman must often stand in an uncomfortable posture in order to apply the file or other tool to the work properly. To overcome this difficulty, the vise illustrated has been devised and found very successful; it has a spherical base that can be adjusted to any position within an arc of 90°; this makes the vise especially adapable for use in assembling small parts where individual fitting is necessary.



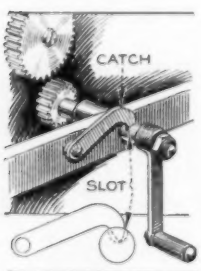
Bench Vise that Will Be Found Very Useful by Toolmakers and Machinists, as the Base Can Be Adjusted to Many Positions

The constructional details and dimensions are clearly indicated in the drawing, but may be varied somewhat to suit individual tastes and requirements. The vise jaws slide in a T-guide that forms part of the body of the vise. A screw with right and left-hand threads, turned with a small socket wrench, moves the jaws. The jaws are, of course, made of steel, and are hardened and tempered.

The body, as well as the flange base and the plate underneath, is made of cast iron, although steel or brass will serve equally well. Machine bolts hold the flange base and the plate securely to the bench. A screw, provided with a ball-shaped head that seats in the body of the vise, and with a wingnut that can be loosened or tightened to permit adjustment, clamps the body when set. A setscrew in the side of the guide may be used to lock one jaw of the vise in position.

Simple Lock for Hand Crank

On certain types of machinery, such as printing presses, some sort of hand crank is required to complete a certain cycle of operations or to bring a certain part of the machine to a position for adjustment or repairs. In case a gear-driven manual movement is used, the gears can be prevented from accidentally meshing by means of a simple catch of the type shown in the illustration. A semicircular groove is milled in the shaft to receive a flat-steel dog, which is fastened to some convenient point on the machine frame. The groove should be cut in the top of the shaft as the weight of the crank handle will cause this side to remain up at all times. When it is desired to engage the crank with the machine gear, it is only necessary to turn the crank to disengage the dog, and the gears can then be meshed.



Tearing Off Stamps

Generally the hardest and most disagreeable part of getting out a large lot of mail is the stamping of it, as the stamps soon become sticky if handled very much, and any attempt to tear up a number of sheets at once while flat, results in mutilating some of them. An easy method of tearing off a large number of stamps into strips is to roll several sheets into a tight roll about 1 in. in diameter. The successive rolls can then be broken off at the perforations without any danger of tearing the stamps. As many as ten sheets can be torn at one time in this way.—James Ellis, Memphis, Tenn.

Carpenters' Improved Tool Box

By EDWIN M. LOVE

THE ideal carpenters' tool box should be light and strong, simply built, with space enough for all tools used on the ordinary job, and have a special place for each tool, so that the owner can see at a glance what tools, if any, are missing.

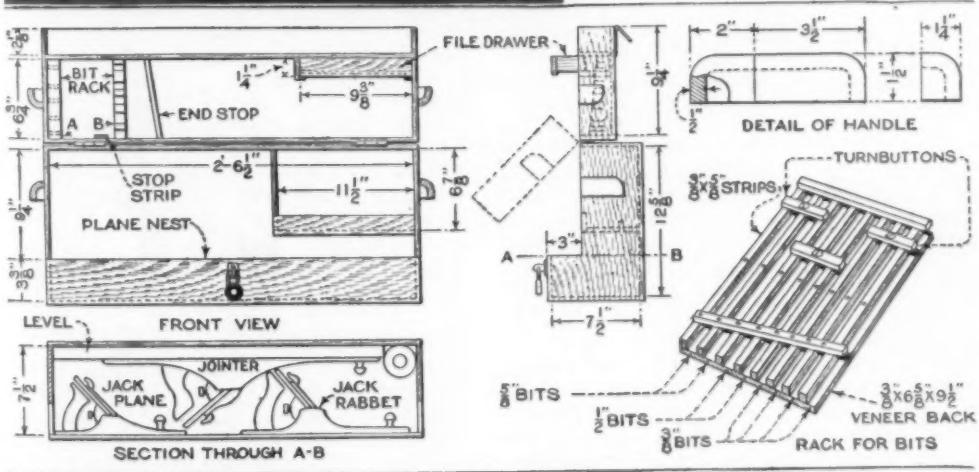
The tool box shown in the accompanying illustration fulfills these requirements almost perfectly, being but 31¼ in. long, 8¼ in. wide, and 13⅜ in. high when closed, yet it opens into a vertical rack displaying all tools to the sight, with the most frequently used tools removable instantly and independently of the rest.

Three-ply birch panel veneer, ⅜ in. thick, is the material used, the main grain of the wood running lengthwise of the box on top, bottom and sides and vertically on the ends.

Make glued butt joints, nailing with three-penny common nails every 2 inches. Lay out the lid, bore the hinge holes in the top of the box, and then rip the lid loose; this insures a perfect fit without further work. Attach the hinges with machine screws and nuts. The handles, made of hardwood in two pieces, as shown in the drawing, enable both lid and box to serve in the carrying strain.

Make a bit rack, as shown, of two tapered blocks, A and B, and place in the lid, block A being bored and B slotted. This rack is for seven sizes, from 1/8 to 1⅛ in., and the bits are placed shank to lip, to save space. This rack is covered by the small-bit rack shown in the lower right-hand detail. Make this, on a ⅜ by 6⅝ by 9½-in. veneer back, with ⅜ by ⅝-in. strips, and attach turnbuttons to hold the bits. This rack is held firmly by the large-bit rack end stop, two small stops glued to the bottom and side of the compartment, and a small hook and eye attached to the end stop. By means of light turnbuttons, a butt chisel, spokeshave, bevel square, and gouge are held on the back of the smaller bit rack.

Nest the planes in the bottom, on their sides, as shown in the drawing, with the level behind; slip the take-down square behind the level and fill the spaces with butt gauge, greaser, oilcan, etc. The boxlike shelf at the right



Above, Tool Box Open Ready for Work, with Saws on Shelf; Below, Full Details of Construction, and Method of Nesting Planes

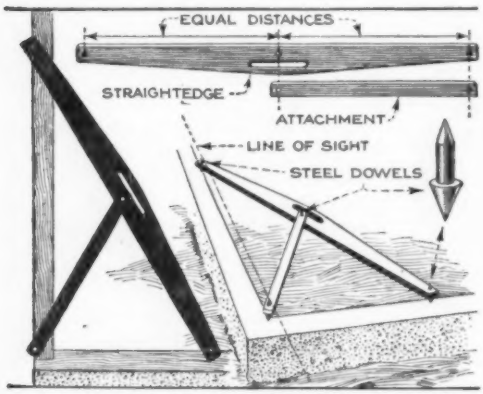
contains a No. 45 universal plane, suspended upside down, with the boxes of cutters below in a vertical position, and the iron rabbet plane in front. The push drill lies behind the edging of the shelf, the block plane stands on end at the left side, and the hand drill is tucked in as well. The arrangement of the other small tools must be governed by the number and style, but turnbuttons seem to be the most practical means of keeping them in position. It is a good idea to silhouette all tools in black on the inside of the box, in position, so that any missing may be noticed immediately, when the box is packed.

Rip a hardwood strip 7 in. long to slip over the saws and keep them well nested as they lie in the bottom of the box, on top of the planes. With this strip they can be lifted out bodily and set up on the upper shelf of the lid, as shown in the photo. Note that this shelf is exactly 2⅛ in. below the edge, so that it will slip over the saws when the lid is down.

Make and attach the small file drawer shown in the upper right-hand corner of the lid. Reinforce the edges of the box with ¾ by 1-in. galvanized-iron window flashing, nailing with 5/16-in. brass escutcheon pins, well clinched. Put on a hasp and catch, and paint the box, and the job is done. If the box must stand out in the rain, carry a small strip of oilcloth to lay over the top.

Right-Angle Attachment for Straightedge

In building construction every part must be made plumb or square and the tools used to do this are a large steel square, a plumb line, a chalk line, and a spirit level.



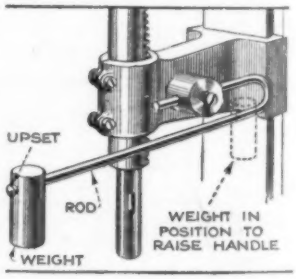
Accurate Method of Laying Off Right Angles by Means of a Simple Attachment for the Straightedge

An easily improvised tool that will serve the purpose of these tools in many cases, with results that are just as accurate, is an ordinary 8-ft. straightedge fitted with the attachment shown in the illustration. Two pointed steel dowels are driven into the ends of the straightedge, and a similar dowel exactly halfway between. Pivoted loosely on the center dowel is a length of 1 by 3-in. piece of wood, also fitted with a dowel at the end. The distance between the center dowel and each of the other three dowels must be exactly equal, as the accuracy of the device depends on this.

In using this device for laying off the corners and other right angles of walls, the dowel on the attachment is carefully set on the corner as shown in the drawing, and, with one end dowel on the straightedge in line with it on the edge of the wall, the other dowel will lie on a line that is exactly at angles to the first. The correct position of a mark at the other end of the wall, or any other point in line with either side of the right angle, can be sighted over two dowels as indicated by the dotted lines. The three end dowels will always be located at the point of a right angle and its sides, regardless of the position of the attachment.—G. A. Luers, Washington, D. C.

Gravity Feed for Drill Press

Sensitive drill presses may be made self-feeding by means of the simple arrangement shown in the drawing. This works well for small holes through material of medium thickness. The regular feed handle is removed and a piece of round stock of the same diameter, doubled over at one end as shown, is substituted for it. On this piece a weight made of heavy round stock drilled near one end is placed. The outer end of the bent handle is upset a little to prevent the weight from sliding off. In operation the weight is slid out to the long end of the handle, as indicated, to feed the drill through the work while the operator is engaged with other work. The drill head is raised automatically by slipping the weight to the back.



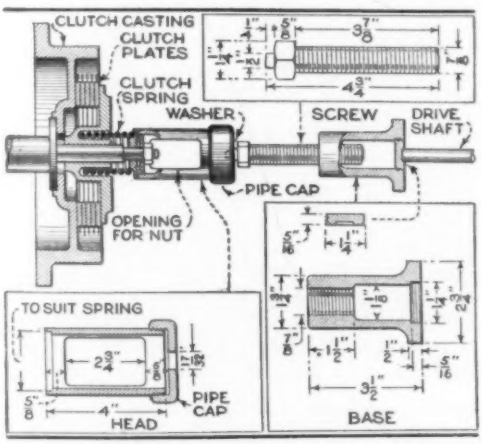
Jack Aids in Assembling Clutch

Considerable difficulty is usually experienced in removing and replacing the clutch spring while dismantling or assembling an automobile disk clutch. However, the special jack shown has been found to overcome the difficulty.

The illustration shows plainly how the jack is assembled and used. The base, which is made of cast iron, is drilled and tapped at the top for a ⅞-in. screw and at the bottom for a 1¼-in. plug, which is counterbored to fit the drive shaft.

The head that holds the clutch spring is made of a suitable piece of steel or wrought-iron pipe. It is counterbored at one end, 1/32 in. larger than the diameter of the spring washer, and has large slots cut in the sides to admit the thrust bearing and nut, when the spring is compressed. It is fitted with a standard pipe cap on the other end, the cap being drilled to fit over the small pivot turned on the end of the screw. The screw is made of a good grade of steel, and has a hexagon head.

In use, the clutch is first assembled;



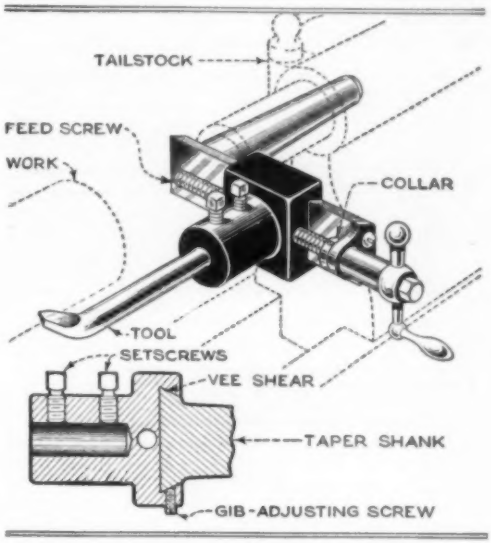
A Jack for Compressing an Automobile Multiple-Disk Clutch Spring that Has Been Found to Save Time

the head of the jack is then placed over the spring washer, and the base against the drive shaft; after the spring is compressed, the thrust bearing can be put in place on the clutch spindle. The jack can then be released.

Boring and Turning Attachment for Small Lathes

An attachment that will bore and turn short lengths with speed and accuracy, is very useful on small lathes, especially those that are not equipped with a tool-rest or carriage.

The tool consists of a forged center

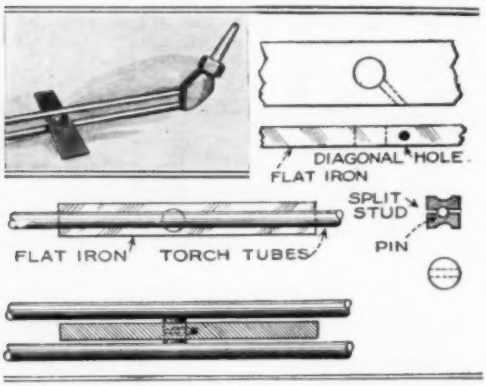


A Useful Attachment on Small Lathes for Boring and Turning Short Lengths Accurately

shank, which fits the taper in the tailstock spindle. On the front end a V-slide extends at right angles to the axis of the shank. On this V-slide is mounted a tool saddle, made from a steel block of suitable proportions, which can be made to slide in or out by the action of a feed screw. The tools are made of drill rod, the largest ones of ½-in. stock. When using smaller tools, bushings are used to take up the play in the tool slide, the bushings being split so as to allow the setscrews to hold the tools. To work to the best advantage and accuracy, the tail spindle should be clamped just snugly enough to prevent vibration under a cut. In making the shank of the tool it is advisable to turn up the taper shank and face the front of the slide between centers. Then the faced slide can be mounted on parallels on the shaper and the angular sides of the vee can be shaped. This method of making it will insure the squareness of the fixture. In order to have the tool-receiving hole in alinement with the headstock center, this hole should be drilled, after assembling, with a drill chucked in the head and with the attachment fitted in the tailstock. The operations possible with this attachment are drilling, boring, turning, facing, and cutting off. When used for cutting off, a support, such as a tee rest, should be placed below the tool.

An Acetylene-Torch Rest

Many jobbing welders have felt the need of a simple rest for holding the torch during the short time required to move the work to a new position, or to place a new



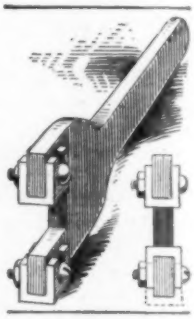
A Rest for the Acetylene Torch, of Utility when Laying Aside the Tool to Change Work

piece. A very convenient attachment for this purpose is shown in the illustration.

A short length of flat bar is drilled in the center for a pin, or stud, which fits between the torch tubes. The method of making this stud and assembling it is as follows: It is first drilled through the center crosswise and then sawed in two through the center of the hole. Both ends are then filed concave so that when a pin is inserted in the two halves of the hole, the split stud is a snug fit between the tubes. The last operation consists in drilling a diagonal hole the same size as the pin through the side of the bar as shown. In assembling, the stud is placed in the hole in the bar, and, the pin being out, it slips easily between the tubes. Then the bar is turned to the angular position necessary to line up the diagonal hole with the hole in the stud and the pin driven in the latter, clear of the bar. This arrangement is necessary to prevent the pin from working out, for, as the bar is always held lengthwise except when the torch is to be set down, the two holes are never in line. With the bar attached to the torch in this manner the latter is supported so that the flame is directed upward and away from the operator.

A Solid Adjustable Wrench

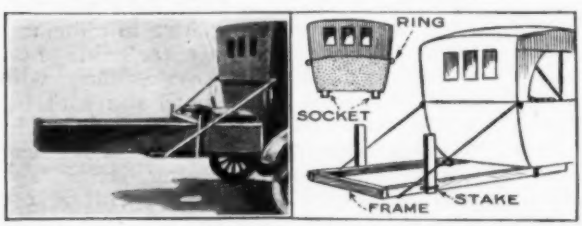
On production work it is highly desirable to use special wrenches with as little adjustment as possible, to suit the nature of the work for which they are used. A wrench of this kind, which was designed to fit three sizes of nuts, is shown in the drawing. The body of the wrench is made of flat stock and two small jaw pieces are bent and slotted as indicated to fit the jaws, and attached by means of small screws and nuts. When using the wrench on the largest size nuts, both jaw pieces are swung to the outside position as indicated by the dotted lines in the lower detail. When used for the next size, one jaw is swung to the inside, as at the left, and when used for the smallest size, both jaws are swung to the inside. This wrench was used on a milling fixture, where it was found much more convenient to have one wrench for this purpose than three separate wrenches.



Substitute for Trailer

The demountable attachment shown in the photograph was made by a paperhanger, and has proved to be an excellent substitute for a trailer. It is very sturdy, and can be attached or detached in a few minutes.

The framework is made of 2 by 4-in. lumber, constructed as shown in the drawing. To the underside of the frame ¾-in. boards are nailed to form the floor. A 2 by 4-in. stake is fastened on each side and the load is kept in place by lashings, tied around the stakes. The inner ends of the frame extend beyond the flooring, and fit into two U-shaped metal sockets, bolted to the chassis. Iron rods, attached to eyes or rings on the back of the body, as shown, support the rear of the carrier.



Attachment for Light Touring Car Permits Bulky Objects to Be Carried Easily

Replacing the Charging Indicator

Many older-model cars are fitted with a charging indicator, which merely indicates "charge," "off," and "discharge." It will be found a great convenience to replace this indicator with an ammeter, as this will not only show the rate at which the charging or discharging is taking place, but, by abnormal readings, will warn of any grounds in the circuits. The ammeter will also show when the generator is not charging at the correct rate. When connecting, care should be taken that the starting-motor current is not taken through the ammeter, as this will ruin it immediately; only the lighting, ignition, horn, and charging current should pass through either ammeter or indicator.

Handling Shock Covers

When curing alfalfa, it often occurs that wet weather sets in and much of the hay in the shocks is damaged. This damage can be prevented by using heavy canvas covers, which will save the fodder from being saturated by rain. A weight is, of course, tied at each corner to prevent the wind blowing the covers off.

An Illinois farmer found it practical to make a large number of small concrete

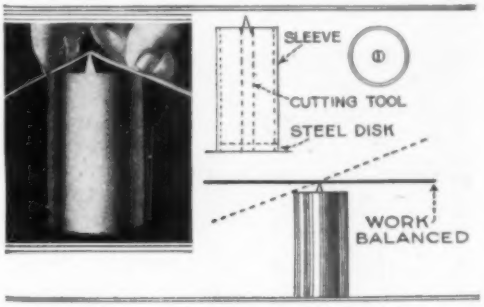
Weighted Canvas Shock Covers that Protect Alfalfa Crop from Rain, and Skid Used to Carry Them

weights for this purpose, and a simple skid for carrying the weighted covers around. The covers are neatly hung on the top rail of the inverted V-shaped skid, so that they can be instantly lifted off and placed over the shocks, one by one.

¶ Painters, carpenters, and others, using ladders frequently, will find that if the center of the ladder, where it balances, is marked with a strip of bright-colored paint, the workman can grasp the ladder at this point immediately when preparing to carry it, thus saving energy and time.

Balancing Tool Divides Strips

In a factory where a quantity of brass-strip binding is used, a novel tool for



Tool for Dividing Brass Strips Equally: Insert, Bending Balanced Strip Before Cutting

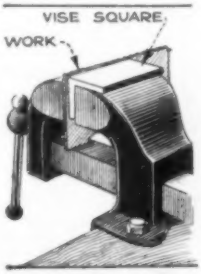
cutting the material has recently been adopted.

Two strips of regular length are often cut in two to suit the smaller sizes, and because so many different lengths have thus to be divided equally, the balancing tool shown in the illustration has been found more efficient than the old method of marking the strips for center and then cutting them.

The tool consists of a piece of round steel, flattened at one end and shaped to a chisel point, and a sleeve, a trifle shorter, cut from iron pipe; both of these pieces are a drive fit on a steel disk. In use the brass strip is laid on the cutting tool and moved until it balances. It is then bent down on both sides, as shown in the photo, tapped with a hammer and broken in two.

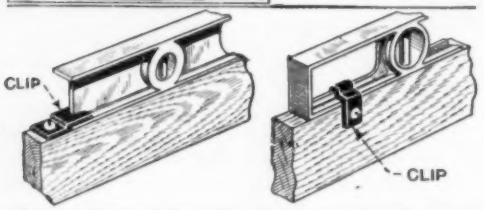
Square for Filing Templates

When filing templates having several straight edges in the vise, considerable time can be saved and eye strain prevented by using a vise square of the type shown in the drawing. It should be made of tool steel, hardened and ground, and should be just as long as the width of the vise jaw. After the template has been roughly cut down to the desired size, about 1/32 in. outside of the lines, it is ready for filing and is clamped in the vise as shown, matching the line with the edge of the square. The latter prevents the workman from filing the template down too far. —Chas. Homewood, Ontario, Calif.



Level Clamps for Carpenters' Straightedge

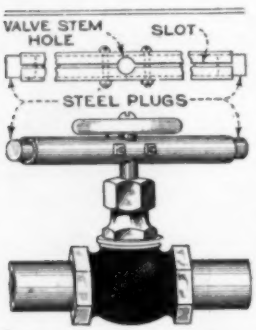
Plumbing and straightening door jambs by the usual method necessitates holding a straightedge against the jamb, and pressing the spirit level against the straightedge. A California carpenter clamps his level to the straightedge and uses the two as a single unit, thus simplifying the handling and leaving one hand free to shift the jamb into position. The drawing shows two different kinds of clips, which can be made to hold the solid or open-frame type of level.



Above, Plumbing a Door Jamb; Below, Clips for Solid or Open-Frame Levels

Quick-Acting Test Valve

The drawing shows how an ordinary valve, used to control the water pressure on a testing bench, was made quick acting. The testing operations made it necessary to open and close the valve every few minutes, and this consumed considerable time; whereas the device shown in the illustration enabled the operator to spin the valve wheel, opening and closing the valve in a fraction of the time otherwise consumed. The device consists of a short length of tube, two round steel plugs, and a couple of nuts and screws. The tube is drilled in the center to fit the valve stem and at right angles to this on each side to take the screws, and afterward slotted along its length as shown. The end plugs are a snug fit in the tube, and before the final tightening of the tube on the stem, the weights are moved in or out to attain correct balance. When correctly set, a slight spin of the wheel opens or closes the valve.

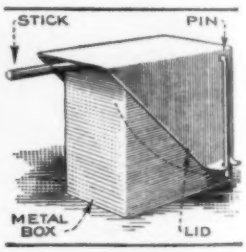


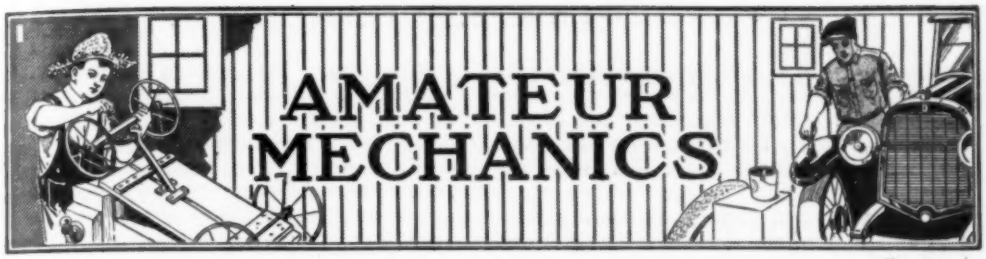
Brazing and Soldering Flux

Steel or copper brazing, and tin or copper soldering, can be greatly facilitated by using a flux of the following ingredients: Muriatic acid 4 oz., zinc, 1 oz., sal ammoniac 1 oz., English resin, 1 oz. Add the zinc to the acid, a little at a time, and then add the other ingredients. If one wishes to economize, 2 oz. of water may be added. The surface of the steel to be brazed is first swabbed with the flux and then wiped dry with a clean cloth; for soldering, however, it is not necessary to wipe the metal dry. Ordinary resin can be used if English resin is not obtainable.

Self-Closing Cover for Box

In shops doing a great deal of valve and plug grinding it is necessary to keep a cover on the box containing the grinding compound, as the smallest piece of foreign matter may cause a scratch that will take considerable extra grinding to remove. The box shown in the drawing is made of tin, and is fitted with a special cover, extending well beyond the front edge and bent to fit down over the sides as shown. Holes are punched in the top of the can and in the cover, and a wire pin is passed through the holes and bent down over the sides. The ends of the cover sides are bent out at right angles, as shown, and slotted to fit over the lower ends of the pin. After taking some compound out of the can, which is done with a stick, the cover will close itself as soon as it is released. The stick used for applying the compound should be thin enough to pass between the cover and the front end of the box, so that it can be placed in the position indicated when not used, to protect it from foreign matter also.





Cycling on Snow and Ice

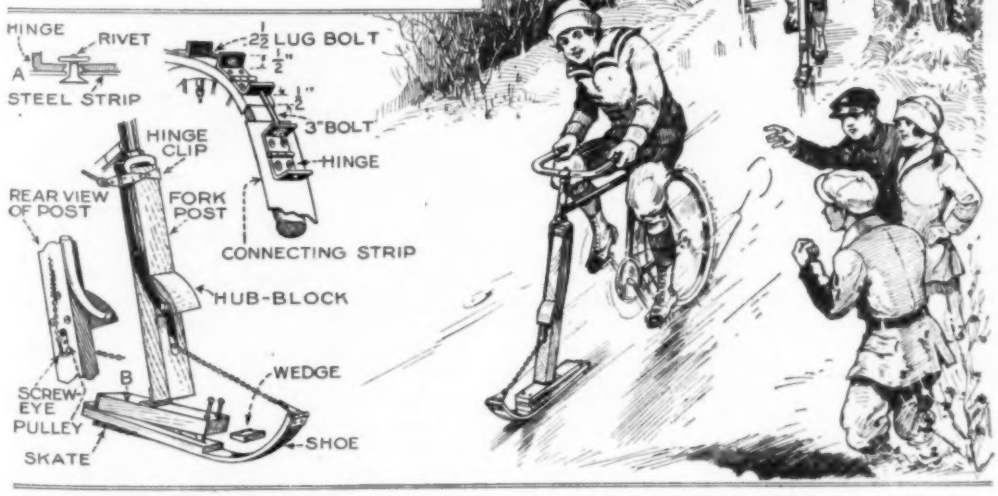
By R. B. CUTLER

SEASONABLY shod with a tread such as that shown in the illustration, the "bike" can be depended upon for winter sport, or ordinary uses over ice and snow. With ordinary tires, cycling is not only hard work, in winter, but precarious; with the tread described here, however, good traction is assured, and the runner makes the machine easily handled.

The necessary materials are; twenty 1⅛ by 3-in. back-flap hinges; seventeen ⅜-in. stove bolts, 2½ in. long, and four 3 in. long; three strips of 26-gauge galvanized sheet steel, 2 by 30 in.; ½ lb. rivets and washers; a pair of light 3-in. strap hinges; a 3-in. T-hinge; a pair of 3-in. butt hinges; a ⅜ by 4½-in. machine bolt; six No. 14 screws, 3 in. long; one 1-in. awning pulley; 2 ft. of steel jack chain, No. 16, ⅝-in. link; one screen-door spring, and a skate. For a 26-in. wheel, one less back-flap hinge is used, nineteen ⅜ by 2½-in. bolts, and one 3-in. bolt.

The twenty hinges are bent at each end at right angles, the lugs being ½ in. long, and the countersunk sides opposite the lugs. Beginning ½ in. from the end of each galvanized strip, rivet the hinges to the strips, using four rivets to each hinge, and keeping them 2 in. apart. Equip two of the strips with seven hinges, and one with six, then connect each hinge to the next with the 2½-in. bolts. Cut the strips with ½-in. ends, center them over the rim of the wheel, and connect the end hinges with the 3-in. bolts. Tighten up all bolts, then, with pliers and hammer, shape the sides of the strips to grip the rim.

From 1-in. ash, cut a runner shoe, 3 in. wide and 25 in. long. Cut down 12 in. at one end to ½ in. or ⅜ in. thick and taper the sides down to 2½ in. wide. Steam the toe, or soak it in hot water, then bend it to shape. The fork post fits



A Simple Tread and Steering Runner for the Bicycle that Will Enable It to Be Used in Winter as Safely as in Summer, and that Lessens the Hard Work of Pedaling in the Snow

below the head and is 2 in. wide and 24 in. long (22 in. for a 26-in. wheel); the hub block is 2 in. thick, 5 in. long, and 3½ in. thick, and is bored to take the machine bolt with the post in place. To fasten the post below the head, shape the 3-in. strap hinges to form a clip, screw to the post, and bolt behind the head. With a bit and keyhole saw, cut a ¾-in. slot, centered below the hub block, and extending down 4 in. at the front but only 2 in. at the back.

Cut the piece B of the runner, 2 by 3 in. long, and shape roughly a 3-in. side to fit the skate, placing the heel even with one end. If it is a clamp skate, remove the clamp and either drill screw holes or secure with three 3-in. mending plates as cleats. With the shoe shaped and dry, lay it over the skate with the toe end of B even with the shoulder of the shoe, and locate the skate toe. This point is the limit of the cutout in the shoe for the blade—a slit centered from the heel of the shoe.

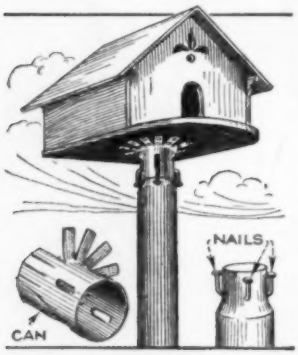
Assemble the runner with the toe point of the skate set in about ¼ in. from the shoe bottom—so that there will be no possibility of "stubbing." At this end there will be perhaps an inch space between B and the shoe. Fit a wedge block here with the heel of the shoe brought up to block B, and secure it with two 3-in. screws driven through B, through the wedge, and into the shoe. These must be countersunk 1 in. and a washer or two used under each screw head. At the heel attach a 4-in. butt hinge, three screws into B and screw in each side of the shoe, then cut off any waste heel. At the toe, rivet the 3-in. T-hinge, as shown.. Assemble the gear to the post with a 3-in. butt hinge centered on top of the B-block.

The 9-in. spring, pulley, and chain keep the runner "headed up" for easier steering, and safety when "jumping bumps." Back of the post, secure the pulley with a screweye set into the lower edge of the 2-in. opening. Cut the spring to length, and with another screweye, fasten one end, then connect up the chain, around the pulley, through the opening to the hinge on the toe of the shoe. With the runner off the ground, if the spring is pulled down to within about 4 in. of the pulley, the tension should be right.

After trying out this tread for a few minutes, tighten up any hinges on the tread if necessary.

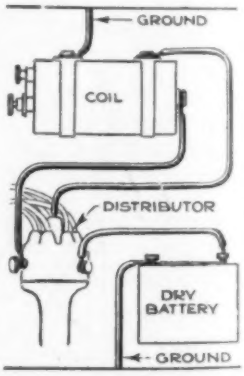
Detachable Bird Houses

It is becoming quite the fashion for country, suburban, and even city dwellers to provide small bird houses in yards and parks. They are usually mounted on poles or in trees, and as they are securely fastened, it is not an easy matter to remove them when it is desired to paint, repair, or clean them, which is occasionally necessary. A method of mounting a bird house so that it can readily be detached is shown in the drawing. The top of the supporting post is trimmed down to fit loosely inside a No. 2 fruit can, which is cut and slotted as shown. The can is nailed to the underside of the bird house and slipped over the end of the pole. Nails are then driven into the slots and bent downward at right angles as shown, so that the can will not slip off. When removing the bird house the nails are turned to the position shown in the lower detail, when the can may easily be released, by an upward pull.—G. E. Hendrickson, Argyle, Wis.



Emergency Ignition Repair

Ignition repairs made in emergencies on the road help to keep the car moving but are usually not very efficient, but a simple repair that was found entirely satisfactory is shown in the illustration. An ordinary high-tension coil of the kind used in a light car, which can be obtained anywhere, and a dry battery, were connected up with the distributor as indicated in the illustration. One of these coil units can be used with any breaker system. It may seem that the firing would be too early, but this arrangement has been tried and found to work perfectly.—R. M. Root, Anderson, Ind.

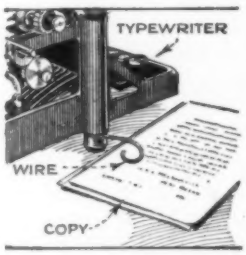


Bumpers for the Garage

Sand bags placed on the floor of the garage make excellent safety bumpers to prevent driving the car against the wall. They are easily dragged about wherever required and may be utilized as cushions upon which to sit or recline when making car repairs. Grain bags, or any heavy canvas bags will serve for this purpose, but they should contain only enough sand to make them about 6 or 7 in. thick.—G. E. Hendrickson, Argyle, Wis.

Simple Copy Holder

When using a typewriter under a fan or near an open window, some kind of holder is necessary to prevent the copy from being blown away. A simple holder can readily be improvised from an ordinary paper clip, the narrow end being left doubled and the wide end bent to the shape shown, so that it will press tightly against the surface of the table. The rubber foot of the left leg is partly unscrewed and the doubled end of the clip hooked around the screw, which is then turned tight to keep the clip in position. The copy is slipped under the spring clip and will be kept there securely.—L. H. Unglesby, Baton Rouge, La.

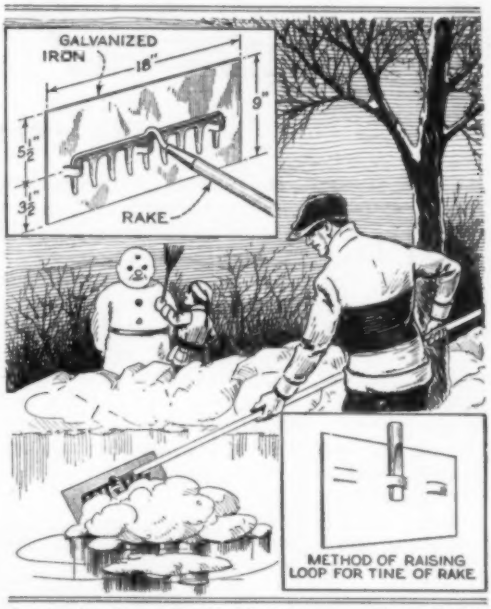


A Kink for Trappers

Every trapper has experienced the disappointment of finding that an animal had been caught in the trap, but got away. The most common cause of this is that the trap is fastened too securely to a stake or tree and this gives the animal a chance to pull itself loose. This trouble can be eliminated by attaching the chain to one or more small branches that will be dragged along when the animal attempts to escape. The work of dragging these tires the animal so much that it will not go very far with the load, and cannot free itself by sudden jerks.—H. H. Siegele, Emporia, Kan.

Snow Scraper Attached to Rake

A serviceable snow scraper can readily be made by attaching a piece of galvanized iron to an ordinary garden rake, as shown in the drawing. The metal should be at least ⅛ in. thick and should be cut to the dimensions given in the upper detail. Short cuts are made at the points indicated and the strips between these cuts bent out as shown in the lower drawing. The loops thus formed should be made so that the tines of the rake must be forced into them, thus preventing the scraper from falling off the rake. A scraper of this kind costs much less than a manufactured one, and, if properly made, serves the purpose just as well.—Lorin A. Brown, Washington, District of Columbia.



Serviceable Snow Scraper Made from a Piece of Galvanized Iron Attached to the Teeth of a Rake

Safeguarding the Aerial

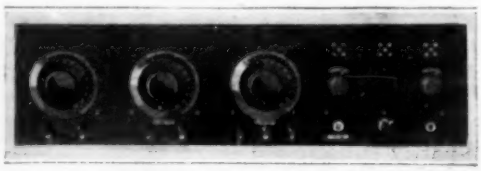
Frequently a single-wire aerial is strung between the house and a near-by tree, and the swinging of the tree in a storm often breaks the wire or pulls it out of the support at the other end. A good method of overcoming this trouble is to place an ordinary screen-door spring between the end of the aerial and the house. This will keep the wire taut and at the same time prevent its being broken so easily. In some cases it may be desirable to have springs at both ends of the aerial.

BUILDING A FIVE-TUBE NEUTRODYNE RECEIVER

By F. L. Brittin

Part I—Assembling the Set

THE barriers to perfect long-distance reception have been removed by the design of the neutrodyne receiver, a result long desired, and heretofore regarded as almost impossible of achievement. Undesirable oscillation and regenerative effects are eliminated in this circuit: the tubes are prevented from oscillating by two condensers of very small capacity, called neutrodons, which are used to neutralize the grids of the radio-frequency amplifying tubes, thus preventing distortion. It is reported that radio messages from the MacMillan arctic expedition have been received with great clearness on a set of this type, although this is not surprising, in view of the fact that the same messages have been heard on a set of the type described in our March, 1923, issue, a set not especially adapted for long-distance reception.



Front View of Panel, Showing Location of Controls

The receiver is simple to construct, and consists of two steps of tuned radio-frequency amplification, the detector, and two steps of audio-frequency amplification. Three "neutroformers" are used, one as a tuning element, the others as tuned radio-frequency transformers. The neutroformer consists of two fixed windings, coupled to a 13-plate variable condenser and placed on the panel at an angle of 54.7° from the vertical. The builder need not trouble about the angle if the panel-template drawing is followed closely, as the holes are spaced to suit.

Bakelite, micarta, or hard rubber may be used for the panel, which is of standard size, $\frac{3}{16}$ by 7 by 26 in. Lay out the panel template, full size, on bristol board, pricking the centers of the holes with the point of the dividers. Clamp the template to the panel firmly, and with a sharp-pointed scriber, mark the position of each hole. This must be done carefully, especially the neutroformer-screw and shaft holes. The measurements should be checked after removing the template, and the scriber marks made deep enough so that the drill will not slip, or they can be gone over with a prick punch. Use a No. 26 drill for all holes not marked otherwise, and countersink all holes marked with a double circle. Of course, holes for similar instruments must be drilled the same size; in some cases, hole sizes were omitted to avoid crowding the template drawing, as in the right-hand rheostat, for example, but the hole size is marked for the left-hand one, and the right is drilled to correspond with this.

After drilling the panel, mount the neutroformers; it is best to purchase these instruments, as well as the neutrodons, as accuracy is of first importance, and when these instruments are made at home there is too much opportunity for error to creep in. This offsets the small additional cost of a standard tested instrument. The windings are placed on two bakelite tubes, the outer tube being 3 in. in diameter, and 2½ in. long. It will be noted that all three secondary windings have a small loop tap at the 17th turn, near the top of the winding when the instrument is in place on the panel. No connection is made to the first or tuner-neutroformer tap, as may be seen in the circuit diagram; the leads from the taps on the second and third neutroformers are carried to one termnial of their respective neutrodons. The leads from the remaining terminals of the secondaries are led to the fixed and movable elements of the 13-plate variable condensers.

The primary of each instrument is wound on a separate bakelite tube, and the ends of the windings brought out to lugs fastened at the top and bottom of the tube. The primary is inside the secondary tube in the assembled instrument.

Two single panel-mounting sockets are used for the first and second radio-fre-

quency amplifying tubes, which should be UV 201A type for best results; dry-cell tubes can also be used, but are not nearly as satisfactory. The remaining tubes should be of the following types: UV 200 or C 300 for the detector; and UV 201, UV 201A, or C 301A for the audio-amplifying tubes. These tubes all operate on a 6-volt storage battery, and are placed in a 3-tube panel-mounting socket assembly as shown, the detector tube being placed directly behind the vernier rheostat on the panel.

Put soldering lugs under all circuit terminals on the rheostat, sockets, binding posts, and audio-frequency transformers; put a very small amount of flux on the lugs, and, with a good hot soldering copper, tin all the lugs well, leaving a good-sized drop of solder on each lug. This will help greatly in soldering the joints when wiring the circuit, and the lugs can be placed much more easily on the instruments before they are mounted on the panel. Now mount the rheostats, and

and protects the diaphragms of the phones, as well as the ears, from the loud signals that would result were the phones used in the loud-speaker jack. Between these two jacks, a jack switch is mounted, for controlling the current from the filament battery.

Before fastening the panel to the baseboard, wire the negative tube-socket terminals, the power rheostat for the amplifying tubes, the vernier rheostat, the positive-filament tube connections, the jack switch, the detector tube, and the A-battery posts. All this wiring can be done much better with the panel detached from the base. Use No. 14 tinned-copper wire, and cover with varnished cambric tubing —the yellow, not the black, as many brands of black "spaghetti" contain some coloring matter that causes losses. Use bus-bar connections wherever possible, and keep the leads short, especially the connections from the audio-frequency transformers to the sockets and other instruments.

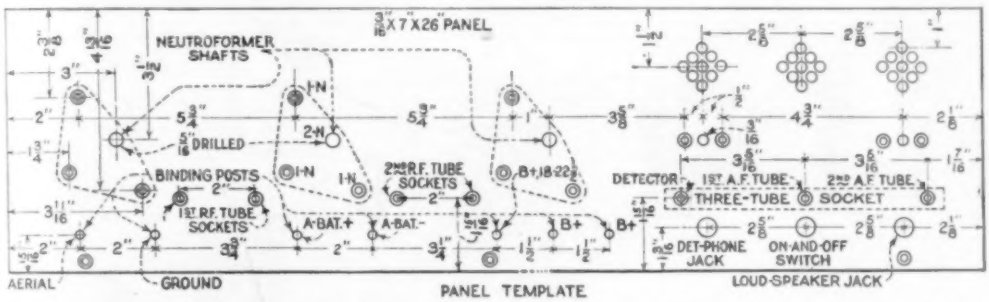


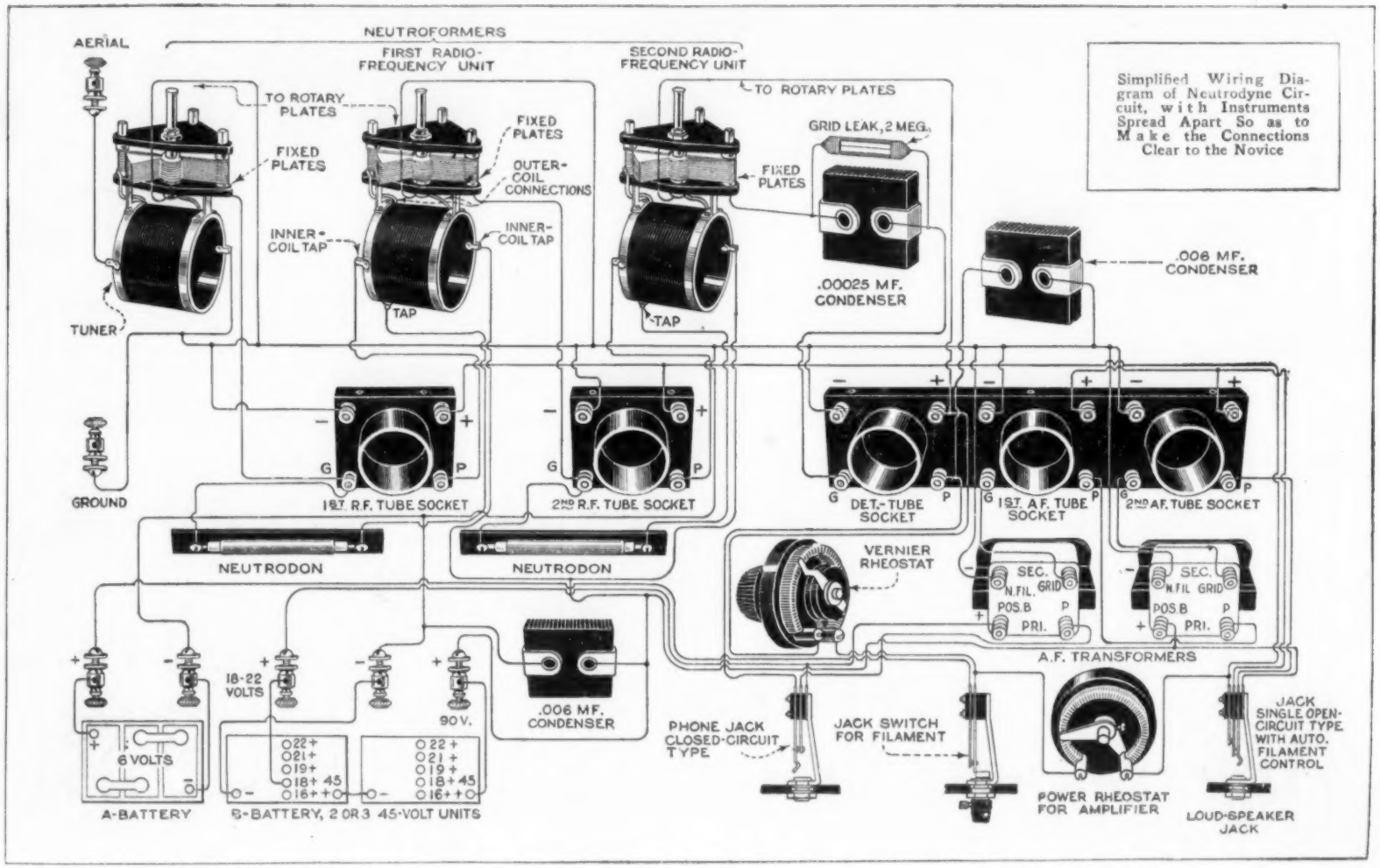
Diagram for Laying Out Panel Template: The Template Is Made Full Size, of Bristol Board, and the Panel Marked from It

afterward the sockets and transformers. When soldering, be very careful not to use an acid flux; use either a good neutral paste, or make up a noncorrosive flux by dissolving 4 parts by weight of resin in 1 part of wood alcohol (poison.) Use a hot iron and keep it clean; polish all joints before soldering; never use a corrosive flux; use only enough solder to make a good joint, and a good, neat job will result. Loose and poorly soldered joints and connections are the main faults with amateur builders, so be very careful with this part of the work, and check it over several times, to prevent subsequent disappointment.

The jacks may now be mounted. The loud-speaker jack is of the single open-circuit type, with automatic filament control; this leaves the audio-frequency amplifying-tube filament unlit when the phones are used in the phone jack. The latter is of the single, closed-circuit type

Now wire up the fixed condensers as follows: A .00025-mf. grid condenser with a 2-megohm grid leak is used for the detector tube. One .006-mf. condenser is placed between the plate lead of the detector tube and the negative filament bus bar. Another is placed across the B-battery 90-volt positive and negative leads; this can be placed at the lower edge of the panel, directly across the leads from the binding posts. Connect the condensers with the No. 14 wire, soldered to lugs, which can be attached to the condensers by small brass machine screws. The heavy wire will support the condensers in any position that is most convenient and allows the shortest leads.

Screw the base, which is ½ by 6 by 26 in., to the panel with round-head nickel-plated wood screws, and complete the wiring, placing the transformers directly behind their respective tubes, so that the leads will be as short as possible; similarly



Simplified Wiring Diagram of Neutrodyne Circuit, with Instruments Spread Apart So as to Make the Connections Clear to the Novice

with the neutrodons. When wiring the circuit, bend the wire with the pliers so as to form the turns with a neat, small radius, and make each wire run at right angles to the others, as far as possible. Cut each wire to the proper length, as closely as possible, and slip on the "spaghetti" tubing before bending. Check the instrument against the wiring diagram.

The B-battery consists of two or three 45-volt units, connected in series. The detector-tube 18 to 22-volt positive binding post is connected to the corresponding terminal on the first B-battery unit. Some tubes require more positive plate voltage than others, so experiment must be made from 18 to 22 volts to determine the correct voltage for any particular tube. The first negative B-battery connection is led to the center B-battery binding post on the panel, and the 90-volt lead to the remaining post. The amplifier positive voltage may be anything from 90 to 130, and the correct voltage must be ascertained by experiment.

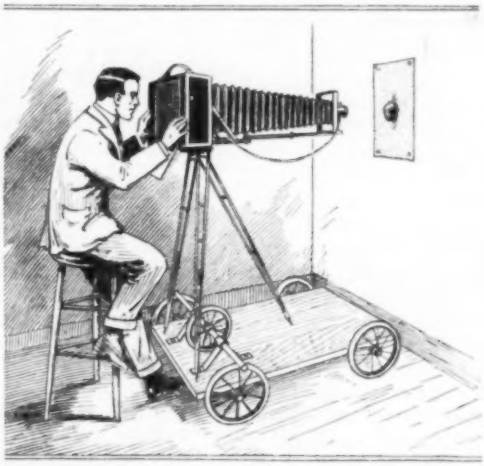
Directions for neutralizing the tubes and tuning the circuit will be given in the March issue.

MATERIAL LIST

1 panel, 3-16 by 7 by 26 in.
1 board, ½ by 6 by 26 in.
1 triple-tube socket.
2 single-tube sockets.
3 neutroformers.
2 neutrodons.
1 filament jack switch.
1 single-circuit jack, with automatic filament control.
1 phone jack, closed-circuit type.
3 4-in. dials.
1 power rheostat.
1 pair phones.
4 UV 201A amplifier tubes.
1 UV 200 detector tube.
27 ft. No. 14 tinned-copper wire.
27 ft. yellow varnished-cambric tubing.
1 vernier rheostat.
2 .006-mf. fixed condensers.
1 .00025-mf. fixed condeser.
1 2-meg. grid leak.
2 45-volt B-batteries.
1 6-volt A-battery.
2 telephone plugs.
Screws, lugs, etc.

Wheeled Camera Stand

When photographing small objects it is necessary to set the camera very accurately, especially in cases where the distance between the camera and the object is only a few inches. The work of focusing it is greatly facilitated by using the stand shown in the drawing. It consists of a wooden platform, made by cleating together several 1-in. boards, mounted on two axles fitted with rubber-tired wheels taken from an old baby carriage, the axles being attached to the platform by means of small U-bolts. An iron or steel rod is mounted in two flat-iron bearings so that it presses against the rear-wheel tires as shown, and a small rubber-tired wheel is fastened to the center of the rod. With this arrangement the platform can be moved a fraction of an inch.



An Adjustable Camera Stand that Greatly Facilitates the Photographing of Small Objects

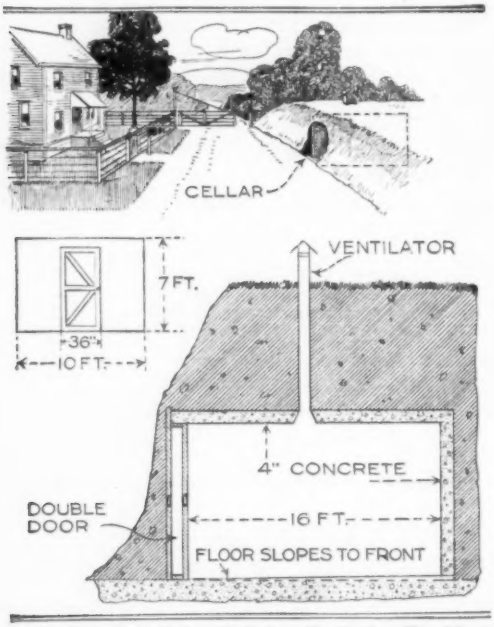
A REQUEST TO READERS

Our readers can do us a greatly appreciated service if they will answer this question: Have you made anything from a description published in this magazine, or restored something to usefulness by making repairs, in home or shop, as suggested in these columns? All we want is your name, and the name of the thing made or repaired.

We very seldom make requests of our readers, but compliance with this one will be a real help to us. Your name will not be included in the printed list if you object, but send us the information just the same.

Cold Cellar Dug in Bank

Many farmers have a concrete cold cellar for storing their vegetables and meat, but in most cases the entrance is very inconvenient, due to the steep and narrow steps and the trapdoor above them. An additional disadvantage of the underground cellar is that it is difficult to clean out and that water readily accumulates in it. All these objections are eliminated by building the cellar in a bank near the house as shown in the drawing. This arrangement permits easy access to the cellar at all times. A suitable bank may be found close to a great number of farmhouses.



A Concrete Cold Cellar, Built in a Bank, that Has Many Advantages Over an Underground Cellar

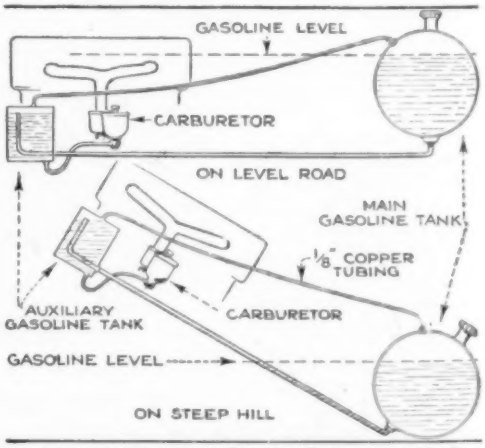
The cellar is made by excavating part of the bank, building the form from rough boards, and pouring the concrete into the form from the top of the bank. Iron rods, pieces of clean wire mesh and clean fence wire are used to reinforce the top. After the concrete has set, the ground is refilled over it to the level of the bank. The top of the cellar should be at least 3 ft. below the top of the bank. A wooden door, about 3 ft. wide, and having a dead-air space as shown, is set in the front end. The floor is laid to slope slightly toward the front so that water will readily drain out, and a 2-in. galvanized-iron pipe, fitted on top with a cap, is installed to provide proper ventilation.—J. V. Romig, Allentown, Pa.

Increasing Humidity of Air

The ordinary furnace water pan has a capacity of about 2 gal., only about half of which is vaporized in one day, under average firing conditions. This is usually not enough and therefore some method of increasing the evaporation must be resorted to. An excellent method, which has been found very effective, is to hang an old flannel or woolen shirt over the edge of the water pan, with one end dipping into the water. The shirt acts as a wick and greatly increases the moist surface in contact with the hot air, and consequently the rate of evaporation.—L. C. Prittie, Ottawa, Canada.

Auxiliary Tank Prevents Stalling on Grade

On automobiles having a gravity-feed gasoline system, the gasoline will not flow into the carburetor when climbing a very steep grade. This trouble can be eliminated by installing a small auxiliary tank in front of the carburetor, and connecting it to the main gasoline tank as shown in the drawing. On a level road the gasoline runs from the main tank into the auxiliary tank and from the latter into the carburetor, so that the auxiliary tank is always full. When climbing a steep grade, the small tank supplies the carburetor, as shown in the lower detail. The gas will not flow back into the main tank because the feed pipe extends almost to the top of the auxiliary tank. A length of ⅛-in. copper tubing connects to the top of both tanks to allow gasoline to drain out of the main line without creating a vacuum in the auxiliary tank.—D. L. James, Wayland, New York.



Auxiliary Gasoline Tank Supplies Carburetor with Gasoline When Climbing Steep Grades

The "Walking Wampus"

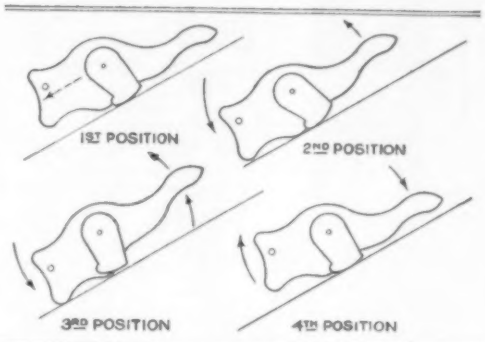
IN the November, 1923, issue of Popular Mechanics was published a description of the "walking wampus," a very unusual and interesting toy. As some of our readers have met with difficulty in laying out the body, and as there is some misunderstanding about the exact action of the toy, the drawing is here reproduced with additional dimensions taken from the original toy, which works perfectly.

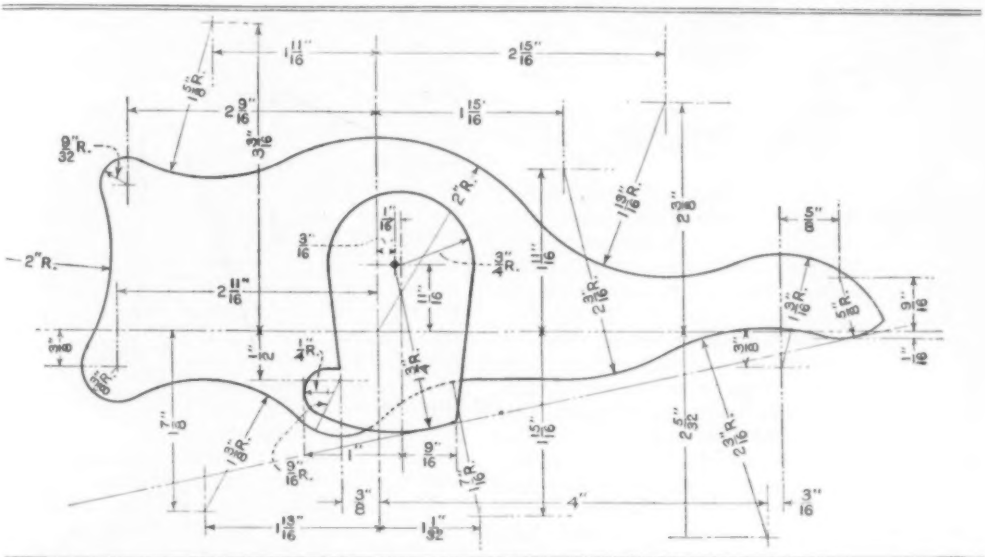
In checking the original, it was found that the pivot point for the legs is about $\frac{1}{4}$ in. above the center line of the body, and that no part of the tail should be more than $\frac{1}{16}$ in. below the center line.

The action of the toy is as follows: Starting with the legs drawn back against the rear pins, the center of weight or gravity, being behind a vertical line drawn through the pivot point of the legs, causes the body to "shoot" forward. The "bump" just in front of the legs strikes the board, and the momentum of the toy causes it to tip forward on its nose. This allows the legs to swing forward against the front pins; the toy then tips back so that the weight is again transferred to the legs, and the operations are repeated.

The exact shape of the toy, therefore, matters little. The nose, the bump ahead of the body, and the lowest point of the tail are the important points, in addition to the center of gravity and the length of the legs in relation to the position of the latter. Each toy is really a separate problem in balancing, although the drawing, as stated above, gives the dimensions of a toy that works perfectly. The block of wood used might have a dense spot, thus changing the position of the center of gravity; this would necessitate changing the pivot point for the legs and lengthening or shortening them to compensate for this, or weighting the toy to bring the center of gravity to the proper place, which can easily be done with small pieces of lead.

There are two pins driven into the body on each side, to limit the travel of the legs. The position of these pins is not shown, as this must be determined by experiment for each individual toy.—L. R. Bochier, Des Moines, Iowa.

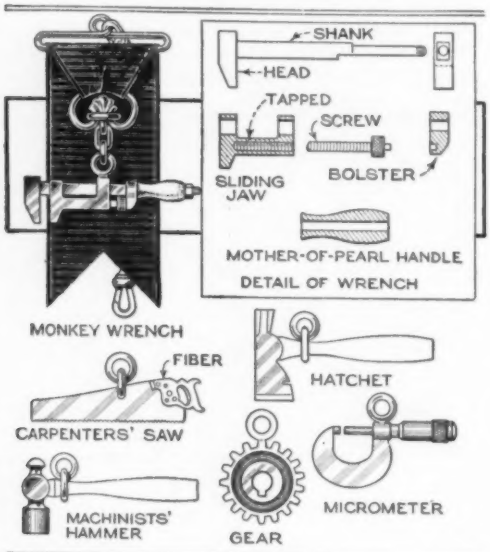




Above, Illustration Showing the Action of the "Walking Wampus"; Below, Full Dimensions Taken from a Toy that Works Perfectly

Mechanics' Watch Charms

Any mechanic who likes to make things in his spare time, can turn his labor and ability into money by making and selling



A Number of Gold-Plated Watch Charms in the Form of Tools Used by Various Trades

mechanics' watch charms. These charms are made in the shapes of the tools used by various trades. The material used is brass, which is easy to cut, quite strong enough for the purpose, and can readily be gold plated.

A little gold-plated monkey wrench always meets with admiration and interest. The frame is cut from one piece of brass, and the shank is turned or filed down and threaded at the end for a small nut. The handle is made from a piecc of mother-of-pearl, cut down to the shape shown and drilled lengthwise to fit the shank. The sliding jaw is made by slitting a solid piece of brass, bending the lugs over the back of the frame, and soldering the ends together. The jaw is drilled and tapped for the adjusting screw, which is turned down and threaded to fit, a knurled head being formed on one end. The bolster slips over the shank to receive the tit of the screw. An eye for attaching the charm to the watch chain is soldered to the lower lug of the jaw. The parts are then gold plated, which will cover all traces of solder, and if well done, the plating will wear for many years.

A neat charm can also be made in the form of a carpenter's saw. The blade is nicked on its lower edge with a knurling tool, making tiny teeth that can be seen and felt. The handle is made of black or red fiber, and attached to the blade by means of small brass rivets.

Hammers and hatchets of various kinds also make attractive charms. These tools should have wooden handles, made of ebony or hard redwood, and polished or waxed after they are cut to the proper size and shape. The attaching ring, in such cases, is made by twisting a length of gold wire into a groove cut around the handle.

A small gear and a micrometer have also been found very neat, especially the latter, when handsomely gold plated and engraved. The only tools necessary for this work, in addition to those already possessed by the machinist, are a jeweler's saw, a jeweler's screwplate, and a set of taps to fit.—J. V. Romig, Allentown, Pa.

Handy Container for Liquids

A handy container for oils, gasoline, or other liquids is shown in the illustration. It is especially useful in that the contents may be transferred from it without spilling a drop. The container is made from an old oilcan, or other large tin can, a 2-in. length of ⅜ or ¼-in. copper tubing, and about 15 in. of rubber tubing. A hole, large enough to allow the copper tube to fit snugly, is made near the bottom of the can. The tube is then soldered in, and the rubber tubing slipped over it, bound on tightly, and taped to prevent the rubber from breaking. Near the other end of the rubber tubing is tied a small wire hook to catch on the handle or filler cap of the can. When assembled and filled, the can should be placed on a support so that, when the liquid is to be removed, the free end of the rubber tube will be lower than the bottom of the can.—Leslie J. Smith, Salem, Ore.

Removing Scratches from Showcases

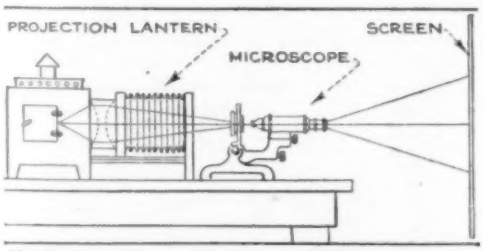
Scratches on showcase tops can easily be removed by moistening some jeweler's rouge with water, and applying it to the surface of the glass with a soft chamois skin or piece of leather, rubbing hard until the scratches disappear.

Drying Clothes in Cold Weather

During cold weather clothes hung out on the line to dry become stiff, due to the frozen moisture in them, and in attempting to remove them they are frequently torn at the corners. This danger can be eliminated by hanging the clothes on wire coat-hangers of the kind used extensively by cleaners. The clothes are hung on the hangers, which are hung on the line. To keep them separated evenly, a number of old yardsticks or laths are used, holes being drilled in them about 3 in. apart, and the hooks of the hangers passed through the holes before they are hung on the line. The clothes are brought in on the hangers and allowed to thaw out before taken off. This method also obviates the usual discomfort of cold hands.—Elizabeth A. Ragan, Seward, Neb.

Projecting Microscopic Slides

Projecting microscopic slides on a screen has been found to be of considerable assistance in a class room, as it enables the whole class to see and discuss the subject at the same time, instead of the students looking through the microscope individually, which takes a great deal of time. The projecting lens of the lantern and the reflecting mirror of the microscope are first removed, and the microscope is then arranged about a foot in front of the lantern, as shown in the illustration. By carefully adjusting the distance between the lantern and the slide, the correct focus

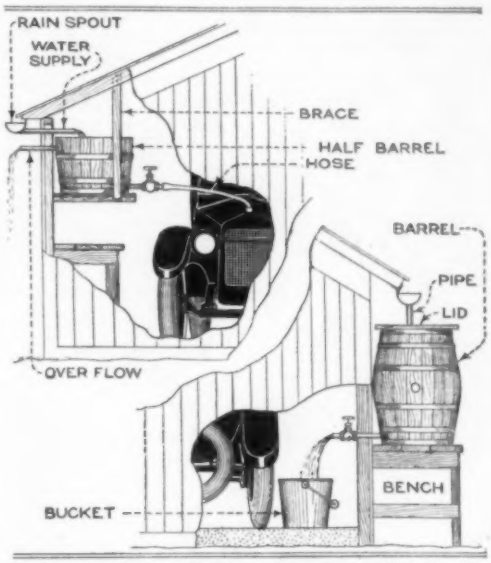


Simple Arrangement of Lantern and Microscope to Project Microscopic Slides in a Class Room

is obtained. The barrel of the microscope is then adjusted so that a clear image will be thrown on the screen, which is located about 15 ft. from the eyepiece of the microscope. The stronger the light in the lantern, the longer will be the distance that a clear image can be thrown. With some types of microscopes it may be found necessary to place a convex lens between the front of the lantern and the slide of the microscope.—W. A. Kimball, Keene, N. H.

Water Supply for Private Garage

Rain water is ideal for use in automobile radiators, as it is free from most of the scale-forming chemicals and salts present



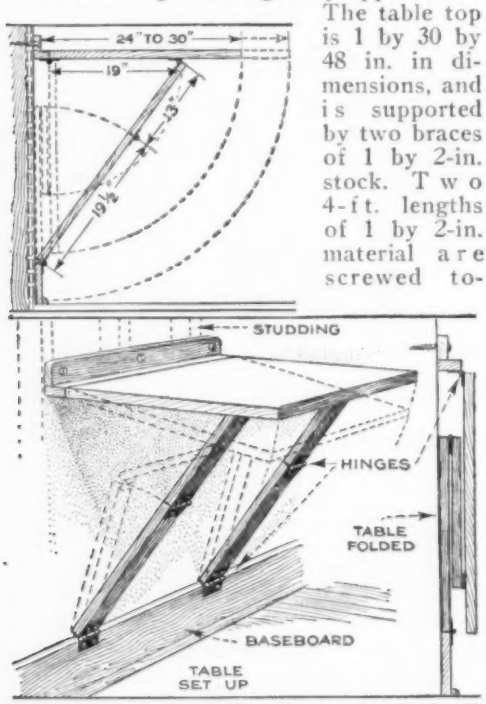
Easily Installed and Convenient Reservoirs for the Garage to Store Rain Water for the Radiator

in well and hydrant water. Two convenient methods of storing rain water in readiness for use are shown in the drawing. The upper figure shows how a half barrel may be arranged on a shelf inside the garage, at a height that will permit the water to flow into the radiator. A gutter is run along the edge of the roof and a small tap pipe from the gutter is brought through the wall as shown, so that the water will drain into the barrel. A short length of pipe, fitted with a valve, is fitted through the side near the bottom and a length of rubber hose is attached as shown. An overflow pipe is also provided. In garages where there is not enough space to permit the installation described above, a barrel may be mounted on a stand outside of the garage as shown in the lower figure. In both cases a fine sieve must be provided in the pipe leading from the gutter, to catch any foreign matter. The inside of the container should be washed out occasionally.

¶When placing a tire chain on a wheel always fasten the inside first and hook it a little tighter than the outside. If this is done and the chain happens to come off, it will most likely come off on the inside, and will be retained by the axle until its dragging is noticed.

A Folding Kitchen Table

In a small kitchen, where space is at a premium, a folding table of the type shown in the drawing will be greatly appreciated. The table top is 1 by 30 by 48 in. in dimensions, and is supported by two braces of 1 by 2-in. stock. Two 4-ft. lengths of 1 by 2-in. material are screwed together at right angles and fastened to the wall by long screws driven into the studs. The table top is then hinged to the lower member as shown. The braces are 32½ in. long, and are cut and hinged so that they will fall into place automatically when the table top is lifted. The dimensions given in the upper detail should be adhered to closely, or enlarged in proportion. To fold the table it is only necessary to strike the joints of the braces with the knee or hand, while holding the table top to prevent it from "slamming." There are no legs to sweep around with a table of this type, and the braces do not prevent a chair from being drawn up close to the table.—G. M. Beerbower, Tarrytown, N. Y.



Folding Table for Small Kitchens that Can Be Set Up or Folded with One Hand

Quick Camp-Fire Lighter

Camp boys in the Yellowstone National Park have a most ingenious mixture for lighting the hundreds of fires in tourists' camps. It consists of sawdust saturated with kerosene, carried in pails, a big spoonful being sufficient to light any fire.

Improving Water Circulation in Radiator

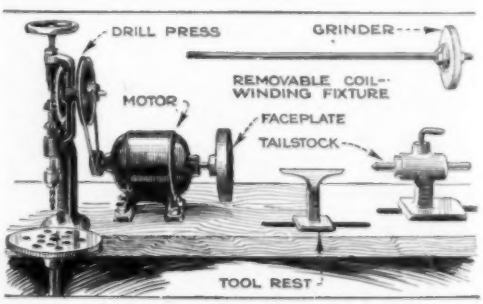
The water in automobile radiators often becomes hot very quickly, without any apparent cause. In such cases the rubber-hose connections should be removed, and it will often be found that the rubber is swollen on the inside, reducing the diameter considerably, which, of course, causes the water to circulate more slowly and makes it heat up more rapidly. To overcome this trouble, procure two new hose connections and also two short lengths of thin brass tubing, which will fit snugly inside the hose. The lengths of tubing must be shorter than the hose connections to allow the latter to be clamped to the radiator and engine in the usual way. The brass tubes will prevent the hose from becoming smaller in diameter and eliminate any future trouble.—William C. Fink, Springdale, Pa.

Increasing Utility of Small Motor

Small motors are very useful pieces of equipment for the workshop, but, in many cases, full advantage is not taken of their utility. The method by which one experimenter doubled the capacity of his motor is shown in the drawing.

Both ends of the armature shaft are utilized. On one end is fitted the small pulley used to drive the drill press. On the other end, a faceplate, interchangeable with a chuck, is fitted, and directly in line with this a tailstock is mounted on the bench, and a tool-rest, to enable light turning to be done. A long arbor, with an emery wheel mounted at one end, is also provided, and may be used for winding coils in addition to grinding. The spools of wire are mounted on simple brackets screwed to the front edge of the bench.

The switch for controlling the m tor may be screwed underneath the bench, at the front.



Doubling the Usefulness of the Bench Motor by Driving from Both Ends of the Shaft

Aero-Propeller Shaft Installations

By J. V. ROMIG

DESIGNERS and builders of aero-propeller-driven craft, such as sleds and boats, are often handicapped by the lack of a suitable but cheap method of installing the propeller shaft. If advantage is taken of standard automobile parts, however, a very neat and close-coupled arrangement, which will give good service and operate efficiently, can be made at a minimum of cost and labor.

Front and rear-wheel hubs from a light car are used to form the main parts of the installation, together with a special shaft and a couple of sprockets. The shaft design is a combination of that of a front-axle spindle and the outer end of a rear-axle spindle or shaft. Between the two parts is a pad or shoulder for the seat of the driven sprocket.

The shaft must be carefully and accurately turned from a solid piece of good machinery steel; the rear end is turned and threaded to the same dimensions as the front-wheel spindle of the car from which the hub is taken, and the seats for the ball races must be held very carefully to size. The front end is turned to fit the rear-wheel hub, threaded for the nut, and keyseated. The seat for the sprocket may then be turned, keyseated, and the thread for the locknut cut.

The front wheel hub, minus the outer flange, is then slipped on, the ball cones adjusted so as to allow the shaft to run freely without any shake, and the locknut tightened and fastened with a cotter pin. The regular hub cap is used, filled with good grease, just as in the car.

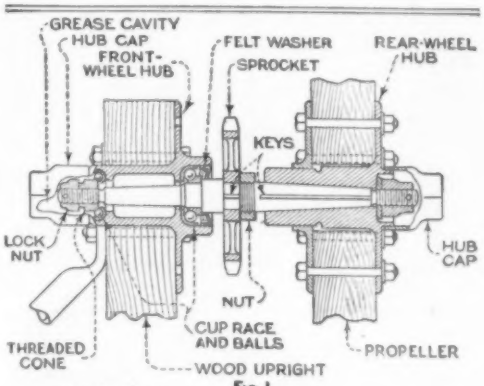


Fig. 1

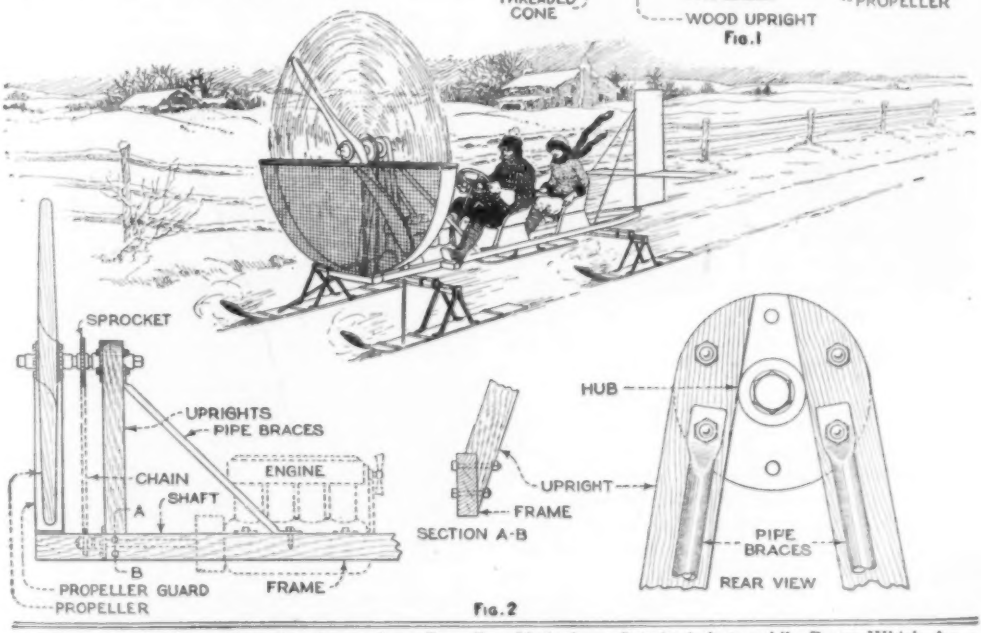


Fig. 2

An Exceptionally Neat Mounting for an Aero Propeller, Made from Standard Automobile Parts, Which Are Easily Obtained and Renewed

The hub that carries the propeller is a rear-wheel hub, as stated above, and it is fitted with a second flange, made out of another hub, which is machined away until a flange is left that will pass over the turned portion of the hub proper.

The propeller hub is drawn up on the tapered portion of the shaft, as in the car, and locked by means of a nut, washer, and cotter pin. The propeller is clamped between the flanges by six through bolts of ⅜-in. diameter, the sliding flange allowing

for a wide variation in the thickness of propeller hubs. A hub cap is screwed on the forward side of the hub, to present a neat and finished appearance.

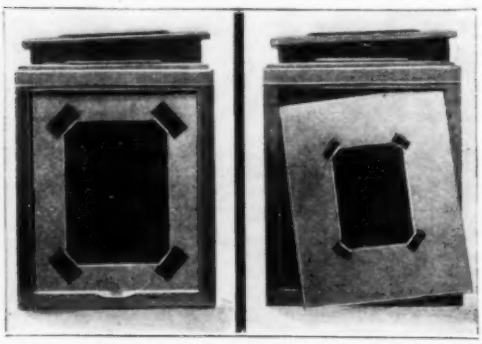
The key that holds the sprocket should be large and set deeply, as it carries all the motor torque.

Two heavy wooden uprights, meeting at the top to form an inverted vee, are bolted to the sills of the frame, and straddle the body of the front-wheel hub as shown. Four ⅜-in. bolts hold the tops of the uprights firmly to the hub. Angular braces, made of 2-in. pipe, are also fitted, the ends being flattened and drilled for the bolts. The propeller should be balanced before installation, to insure vibrationless running.

An arrangement of this type not only presents a good appearance, but, as the bearings are standard, they are easily renewed when worn. Being of the cup-and-cone type, they will take a thrust in either direction, and so are suitable for either tractor or pusher types of propeller mountings. The hub cap should be filled with good grease, to insure perfect lubrication, and refilled at frequent intervals.

Simple Cut-Film Holder

Besides being non-breakable, nonhalation, and light in weight, it has been found that there is also a great economy in using



An Economical Method of Using Pieces of Cut Film of Various Sizes in a Plate Holder

cut films in making negatives. This is especially true if the photographer does much copying work.

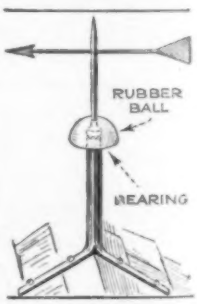
Very often only a small piece of film is needed to make the desired copy. A piece of film is then cut from the regular size on hand, in the dark room. A piece of medium-weight cardboard is cut to the size of the plates for which the plate holder is intended, so that it can be used instead of a plate, and a piece of black paper, cut to the size of the film to be used, is pasted on the center of the cardboard. This is to prevent halation or reflection of light from the cardboard back through the film. Small triangular pieces of paper are cut to fit over the corners of the black paper and these pieces are stuck on the cardboard by means of adhesive tape as shown in the photograph. The film is then inserted under these corners and will be held in place securely. This method of using cut films is economical as the film is cut to the size needed and no margins are wasted. It is, of course, necessary to mark on the ground glass lines corresponding to the different sizes and positions of films used. —Edward H. Flaharty, Denver, Colo.

Improving Radiator Stay Rods

Radiators of most automobiles are supported by a horizontal rod screwed into a bracket on the dash and a boss on the radiator. Due to the constant vibration the threads at the boss sometimes strip and allow the rod to pull out. To repair the boss is a difficult job, and, in any event, prevention is better than cure. If a nut of the proper size is screwed on the rod and locked tightly against the boss, there is very little danger that the threads will ever be stripped.—E. T. Gunderson, Jr., Humboldt, Iowa.

A Weather-Vane-Bearing Protector

Bearings on weather vanes should be protected in some way to prevent them from rusting. This can be done by slipping half of a hollow rubber ball over the bearing. A small hole is punched through the ball to make it grip the shaft securely so that it will not slip down on itself, but can be forced up or down.



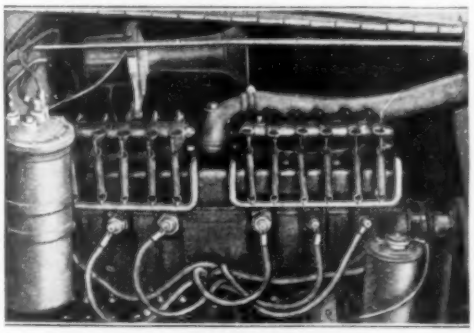
The drawing shows a recording weather-vane protected in this way, the bearing consisting of a bicycle-wheel hub with one flange filed off, and set in the end of a length of pipe, which is split with a hacksaw at the other end, bent and bolted to the roof as shown. The lower end of the rod terminates just below the ceiling of one of the rooms and is fitted

with a pointer. A compass face is provided under the pointer so that the exact direction of the wind can be seen inside the house at any time.

Silencing Overhead-Valve Assembly

In an overhead-valve engine, the wear in the joints of the push-rod and rocker-arm assembly allows considerable play and lost motion. Noise from this source can be partly stopped by careful adjustment of the tappets, but the wear in the rocker arms cannot be compensated in this way, and the engine will be more or less noisy.

This trouble can be avoided almost entirely with the coil-spring arrangement shown in the photograph. Two brackets of ½-in. round steel rod are shaped to fit the head of the engine, as shown, each of the brackets being bolted to the top of the engine and extending down along the push-rod side. A clip of heavy sheet metal is shaped and fitted to each rocker-arm head, above the upper end of the push rod, and short coil springs are stretched from holes in the clips to the brackets. The lower end of each spring



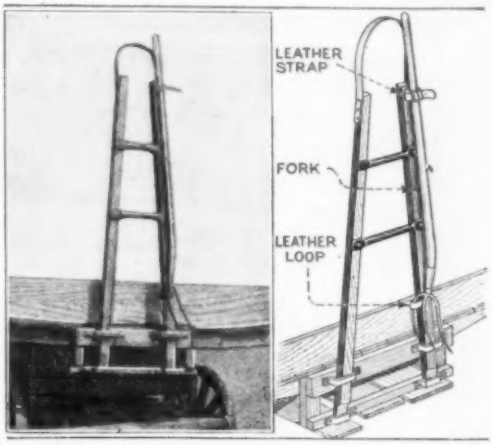
Effective Method of Eliminating the Noise of the Overhead-Valve Assembly on an Old Automobile

is fastened to the bracket by means of a cotter pin; the loop end of the pin is placed above the bracket and engages with the end of the spring, while the split end of the key is spread below the bracket.

The photograph shows a six-cylinder engine equipped with this silencing arrangement. The springs must be of approximately the same length, and arranged so that there is always a slight tension on the rocker arms. These are held tightly against the push rods at all times and thus much of the noise so common to old overhead-valve engines is eliminated.—Lowell R. Butcher, Des Moines, Ia.

Safe Hay-Fork Holder

In hauling hay or grain in the straw it is usually necessary to carry a pitchfork, but accidents often result from placing it



Accidents Are Prevented by Strapping the Pitchfork to the Front Standard of a Hay Wagon

carelessly on the load. A good place to attach the fork, where it will be held securely without any danger, is the front standard of the wagon. Two lengths of leather strap are nailed to one of the upright pieces as shown; the lower strap is simply looped around the handle securely.

With this arrangement the pitchfork cannot be lost, and it is in such a position that accidents are not likely to occur.

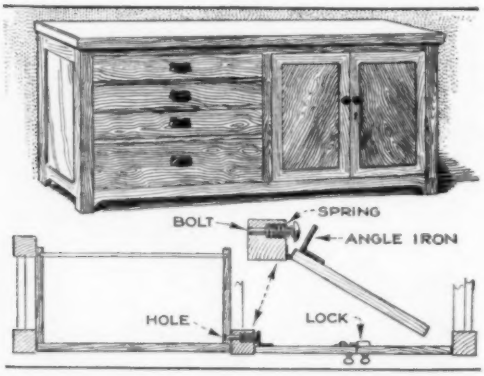
Marking Furnace Grates

When shaking the grates of a furnace it often occurs that a perfectly good fire is dumped into the ash pit because the position of the grates cannot be seen from the outside and are turned in the wrong direction. To avoid this, it is a good idea to mark the ends of the shaker bars that extend outside of the furnace, painting them half white and half black, as shown in the drawing, so that the position of the grate can be seen at a glance.

¶Dipping the heads of clothespins in white paint makes them easy to find in case they are dropped in the grass.

One Lock Fastens Entire Cabinet

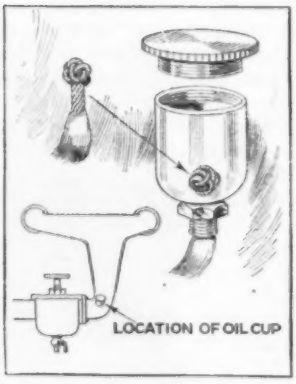
Locking five or more drawers in a cabinet by means of one lock can be done very easily by means of the arrangement shown



A Simple and Practical Arrangement for Making One Lock Do the Work of Five

in the illustration. The detail shows the method of construction; each drawer has a small hole drilled in the side to receive the end of a bolt, which locks it. A small spring, fitting on the bolt under the head, pushes it out of the hole as soon as pressure is released. A length of angle iron is screwed to the inside of the cabinet door, as shown, so that when the door is closed it presses the bolt in and locks all the drawers; one lock on the door will then keep the whole cabinet locked.

Priming the Auto Engine



For quick starting in cold weather, a screw-cap oil cup, of the type shown, is tapped into the intake manifold of the automobile engine, as close to the carburetor as possible. A short piece of frayed-out twine is knotted at one end and inserted through the hole in the bottom of the cup.

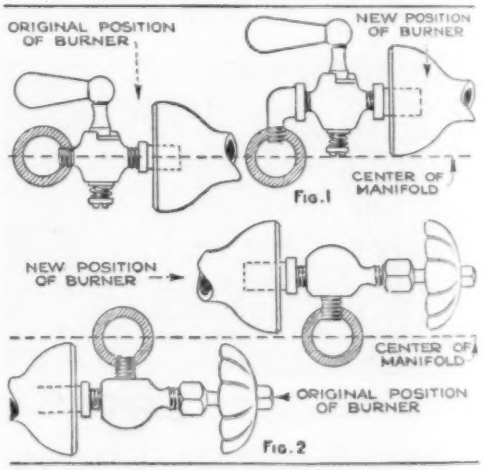
The method of using such a priming device is to squirt some high-test fuel into the oil cup, the fuel being absorbed by the wick and vaporized inside the intake.—J. G. Brown, Evanston, Ill.

A Simple Insecticide

While various kinds of insecticides on the market are effective, they are also rather expensive. A simple solution that is very effective in getting rid of bedbugs and similar vermin, consists of ½ pt. each of kerosene, turpentine, and laundry ammonia. These ingredients are all poured into a quart bottle and shaken well, and the solution is then sprayed or brushed on the surfaces where the bugs have been noticed. It has been found that two applications are usually sufficient.—Tempest W. Fenton, Ashtabula, Ohio.

Raising Gas-Range Burners

The rapid decline of the natural-gas supply has compelled many gas companies during the past year to supply gas at a reduced pressure, and as a result the cook-stoves and ranges designed for high-pressure gas are rendered almost useless. This has resulted in the flooding of the market with so-called gas savers, many of them without any merit whatever. In high-pressure gas ranges the burner is usually from 2 to 3½ in. below the cooking top. These distances are entirely too great for the continually decreasing pressure, for satisfactory cooking operations.



Changing Position of Natural-Gas Range Burners to Suit Lower Pressures

The U. S. Bureau of Standards experts have made many exhaustive studies of burner positions, and the conclusion arrived at is that less gas will be used at low pressures if the burner is within 1 in. of the bottom of the cooking vessel than at the original high pressures with low burners.

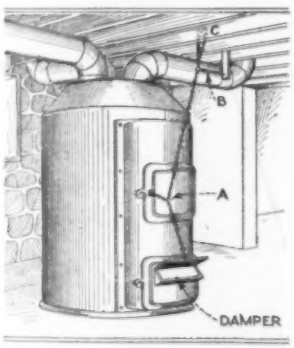
Figure 1 illustrates a straight-cock connection. By turning the manifold through 90° and using a small service ell, the burner of the stove utilizing this type of connection will be raised to a more efficient height.

Figure 2 illustrates an angle-valve connection. By simply turning the manifold through 180° the valve will be above instead of below the manifold and in this way will also raise the burner to a more efficient height. Of course, the valve must be turned so as to face out.

It is a strange coincidence that, on the majority of ranges, this raises the burners to exactly the height recommended by the Bureau of Standards, and is probably the simplest, quickest, and cheapest method of raising burners that can be devised. All that is required in the way of tools are a couple of pipe wrenches.

Closing Furnace Damper Automatically

When opening the door of a furnace to put in coal, the ash pit damper is often left open, with the frequent result that a volume of smoke issues from the furnace door, fills the basement, and penetrates into the rooms above. This trouble can easily be prevented by the method shown in the drawing. The chain that operates the damper on the ash-pit door is made a little slack, and is connected to the handle of the furnace door by a short length of chain, as shown. This arrangement will not interfere with the function of the chain in raising or lowering the damper, and will always allow the damper to close when the furnace door is opened.



Increasing Life of Spare Tires

Motorists will find that the spare tire resists natural aging much better if it is put into service for a day every month. Whatever the cause of the deterioration, it is a fact that a spare carried month after month without being "exercised" does not retain its wearing qualities as well as one that gets an occasional day's use.

Coasting on Ice

Children who live in level regions, where coasting downhill is not possible, will appreciate the device shown in the drawing,

A Novel Method of Coasting on Ice by Means of a Stout Clothesline and Two Heavy Coil Springs

which will enable them to coast on the ice on a pond. A stout clothesline with a heavy coil spring at each end is stretched tightly across the pond, or a bay, between two trees. The sled is pushed backward against the center of the rope as indicated by the dotted lines, and will, as soon as it is released, coast a considerable distance over the ice, due to the action of the coil springs. An old leather heel is nailed to the back end of the sled to hold the rope. The rider pushes the sled backward against the rope by digging the sharp ends of his skates into the ice, or he may be pulled back by another boy.—Dale R. Van Horn, Walton, Neb.

Preventing Pump from Freezing

As an ordinary pitcher pump in good condition does not allow the water in the suction pipe to run down, the water is subject to freezing during winter. To prevent this, I tapped the vacuum chamber directly under the check valves, for a ⅛-in. drain cock, which, when opened, destroys the vacuum and releases the water. When the cock is closed the pump works as well as ever.—W. C. Robson, Cheboygan, Mich.

Carrier for Vacuum Bottle

Vacuum bottles are of great convenience for keeping liquids warm and are used extensively by farmers and workmen, but they are rather bulky to handle and this feature is somewhat objectionable as the bottle is easily broken or dented by dropping it on the sidewalk or ground. Carrying cases are made, but they cost nearly as much as the bottles themselves, and therefore the homemade carrying bag shown in the photo will be appreciated.

An Inexpensive and Serviceable Canvas Bag for Carrying a Vacuum Bottle

For a 2-qt. bottle the bag is made from a piece of canvas or similar heavy cloth, 17 by 18 in. in dimensions. One 17-in. edge is turned over and hemmed on the sewing machine; this edge will later form the top of the bag. The 19-in. edges are then sewed together, and a disk fitting the lower end is sewed on in the same way. Turning the bag inside out will then bring all the seams on the inside. The shoulder straps, which are made from strips of cloth with the edges hemmed, are sewed to the bag as indicated. A bag of this kind is much better than a leather one because it can readily be washed when soiled.—J. R. Koontz, Bremen, Ind.

Stopping Radiator-Hose Leaks

Leakage of the hose connections on automobile radiators can usually be remedied by an application of shellac. The hose connection need not even be removed if the shellac can be run into the joint by gravity. After draining the water in the radiator to a point below the hose level, the clamp of the leaking connection is loosened and some shellac is run in. It is allowed to stand for a few minutes, until nearly dry, and the clamp is then tightened.

Preventing Damage from Battery Acid

Where a storage battery is to be used permanently as for radio, it is well to place it in a shallow wooden lead-lined box, filled with sand, in order to eliminate the danger of having the rug or varnished floor ruined by the acid, which sometimes seeps through. A plain wooden box can be used, but the lead-lined one, with soldered seams, affords absolute protection, while the plain box may allow acid to escape when the sand becomes saturated. Another help is to mix a slight proportion of powdered alkali such as wood ashes or soda in the sand.—George Davis, Oakland, Calif.

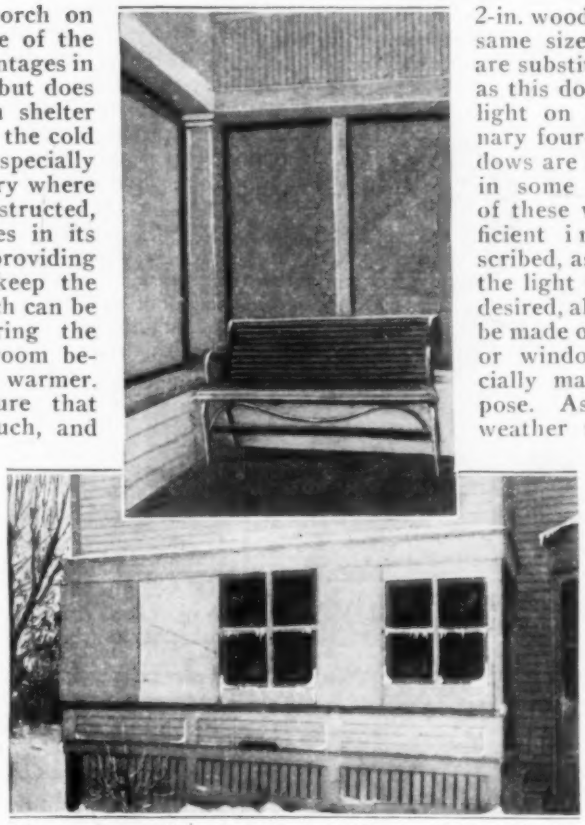
Simple Tube Adapter

It is often desirable to change a dry-cell radio outfit to a larger set using a storage battery for the filament circuit, or to change a larger set so that dry-cell tubes can be used. A simple adapter that permits the use of both kinds of tubes without changing the set in the least is shown in the photograph. It consists of an old tube base that fits the sockets of the set. This is soldered in one end of a 4 or 5-in. length of 1¼-in. brass tubing as shown, and a socket of the proper type to carry the tubes to be used is fastened to the other end of the tube as shown. Four lengths of lampcord are carefully soldered to the terminals of the old tube base, and after being brought through the tube, are connected to the corresponding terminals on the socket. Two ears are formed on the upper end of the tube, bent back at right angles, and drilled so that the socket can be fastened to them with small screws.—W. W. Brackenridge, Harrison, Ohio.

¶A piece of coarse-mesh screen over the flower bowl permits the use of short-stemmed blossoms.

Inclosing the Porch for Winter

A large open porch on the northwest side of the house, has its advantages in the summer time but does not provide much shelter or comfort during the cold winter months, especially in the open country where the wind is unobstructed, and the porch lies in its full sweep. By providing an inclosure to keep the wind out, the porch can be made useful during the winter, and the room behind it kept much warmer. A simple inclosure that does not cost much, and can be made in a short time, is shown in the photographs.



Above: Inside View of the Inclosed Porch. Below: Outside View Showing Arrangement of Storm Windows

The screen sections, which were hooked in the space between the frieze and the seat rail, and are of use during the summer months only, are removed and pieces of heavy wallboard, nailed to 1 by 2-in. wooden frames, of the same size as the screens, are substituted. However, as this does not admit any light on the porch, ordinary four-light storm windows are set in the frames in some sections. Three of these windows are sufficient in the case described, as they provide all the light necessary, but, if desired, all the sections can be made of storm windows, or windows can be specially made for this purpose. As soon as warm weather returns, the sections are removed and stored away for the summer, when the screen sections are again brought out and put in place. Extra-heavy hooks and screweyes should be used to fasten the storm section in place.—R. A. Franklin, Rochester, Minn.

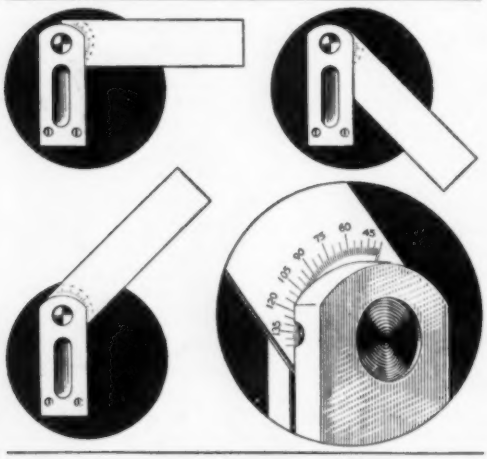
Tanning Muskrat Skins

Formerly many muskrat skins were home-tanned and made into caps, collars, and other articles. The present home utilization of skins is much less extensive, but knowledge of a good method of dressing the fur is still desirable. Most of the methods employed by amateurs involve the use of alum to fix the hair; but satisfactory results, so far as pliability of the pelts is concerned, depend largely upon the labor spent on them. The directions here given, if followed, will give better results than processes using alum.

Prepare a tanning liquid composed of 1 qt. of salt and ½ oz. of sulphuric acid to each gallon of water. This mixture should not be kept in a metal container. Muskrat skins are tanned in this mixture in a day, but they may remain in it longer without injury. When removed from the liquid, wash several times in soapy water. Wring as dry as possible, and rub the flesh side with a cake of hard soap. Then fold them in the middle, lengthwise, over a line, hair side out, and leave to dry. When both surfaces are barely dry, and the interior is still moist, lay them over a smooth, rounded board and scrape on the flesh side with the edge of a worn flat file or similar blunt-edged tool. In this way the inner layer is removed and the skins become nearly white in color. They are then stretched, rubbed, and twisted until quite dry. If parts of a skin are still hard or stiff, the soaping, drying, and stretching process should be repeated until the entire skin is soft. Fresh butter, or other animal fat, worked into the skins while they are warm, and then worked out again in dry hardwood sawdust, or extracted by a quick bath in gasoline, increases their softness.—A. C. Cole, Chicago, Ill.

UNIVERSAL SQUARE LOCKS AUTOMATICALLY

Five different functions have been combined in the latest woodworkers' square, while preserving the shape of the standard rosewood try-square, and keeping within the ideal weight for such a tool.



Universal Square for Woodworkers that Locks Automatically in Most-Used Positions

The handle is made of aluminum, and completely incloses the operating mechanism, which is simple, strong, and very unlikely to get out of order. On one side of the handle is a knurled thumb button; a slight pressure on this instantly unlocks the blade, which may then be moved to any of the five usual operating positions; the square, acute miter, obtuse miter, acute octagon, and obtuse octagon. The blade is rigidly locked as soon as the thumb button is released, and it is impossible to "break" the tool until the button is depressed. The bevel positions are all obtained with the blade swung to the left of the handle, and cover a range of 155°. There is also a semi-positive lock for the blade in line with the handle, for convenience in carrying the tool in tool box.

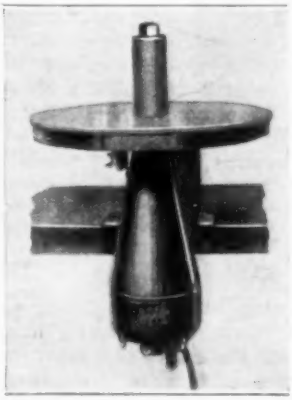
A fine protractor scale on the blade adds to the usefulness of the tool, as it makes it possible to measure or lay out any odd angle, and makes the tool a convenient angle divider. The blade is made of tempered steel, and all wear on the locking mechanism is automatically taken up.

SPRING TOOLPOST PREVENTS CHATTERING

It is the general practice to use heavy toolposts or boxes for carrying tools on automatic and turret-lathe cross slides. The tools are often used for comparatively heavy forming operations, and, although substantial toolholders help to a great extent, they do not always prevent chattering on heavy cuts. A new toolpost has been designed to overcome the tendency to chatter, and as it is effective when used at the front of the slide, it leaves the rear toolpost free for parting tools, and enables the slide to take the pressure of heavy cuts on the horizontal face, and not on the narrow vees. The toolpost is made of mild steel, and carries flat forming tools in a slanting gap. The tool can be set by two hardened setscrews, and clamped by four similar screws. A hole and a saw cut through the lower portion of the box allow it to act like the familiar "gooseneck" tool, and, as the cutting edge of the tool is behind the center of the gooseneck, any movement of the tool under a heavy cut will be in a direction away from the work. At the same time, the top-rake angle is increased, and the clearance angle reduced. In use, it is practically impossible to make the tool dig in when feeding by hand, and the effectiveness of the gooseneck as a spring is proved by the tool continuing to cut when the feed is stopped.

COMPACT BENCH SANDER FOR SMALL SHOP

Pattern shops, and woodworking factories that have not enough internal or irregular work to justify the purchase of a large spindle sander will be interested in a small bench machine now on the market. The tool is equipped with a totally inclosed motor with a speed of 1,725 r.p.m. the motor is directly connected to a reciprocating spindle, which has a movement of 1 in., is equipped with



6-in. roll. The 16-in. table of the machine is ground, and tilts 45° down and 15° up. The over-all dimensions are only 16 by 16 by 25 in., and the machine may be fitted with a pedestal, if desired.

LONG-LIFE MOLDS DEVELOPED IN IRON FOUNDRY

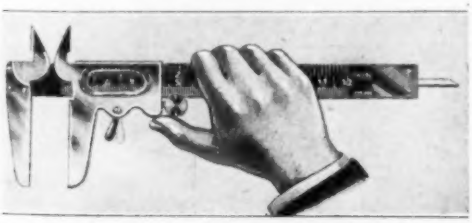
According to Dr. R. Moldenke, an authority on foundry practice, a prominent carburetor manufacturer has developed a mold for cast iron that can be used repeatedly; in fact, some of the molds have already had 10,000 castings made in them, and not one has yet been discarded. This has necessitated constant attention to the molds, of course, but is a great step forward in the molding of cast iron.

The molds are made of cast iron, lined with a highly refractory material, which is protected from abrasion and penetration of fine iron filaments, and which wears to a surface that need be repaired or patched only on rare occasions. While the castings so far made have been light, no great difficulty is anticipated in making heavier ones.

UNIVERSAL VERNIER CALIPER OPERATED BY THUMB

Needing only one hand to adjust it to any size within its range, a new vernier caliper should find instant approval among mechanics.

Both inside and outside measurements may be made with the tool, and, in addition, an extension of the movable jaw serves as an accurate depth gauge. The jaw is moved by means of a small knurled

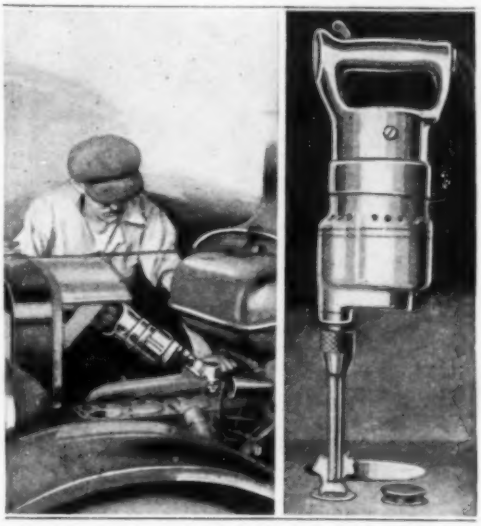


Method of Setting Movable Jaw of Caliper, Using Only the Thumb

wheel, operated by the thumb, permitting very accurate setting, and it may be locked by a small cam lever. The scale is graduated in sixteenths of an inch and millimeters, and, with the vernier, readings to 1-28 in. and 1-10 mm. may be taken. The tool is attractively finished, and will make a welcome addition to any tool kit.

ELECTRIC VALVE GRINDER HAS "HAND" MOTION

Oscillating and revolving movements combined, thus duplicating the motions made when grinding by hand, is the out-



Left, Grinding Valves with the Offset Attachment; Right, Grinder, Showing 3-in-1 Driver Blade

standing feature of a new valve grinder of clever design.

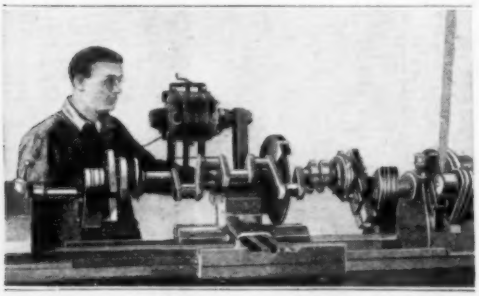
The tool resembles an electric drill, and is provided with 3 and 6-in. grinding spindles, each of which will take any of the valve-driver blades, and which are gripped in the tool chuck. A special hook attachment is supplied for use in grinding valves held in cages, and, when grinding such valves, the body of the tool is held in a special vise. The tool may also be used for loosening stuck cage-type valves, without removing them from the cylinder block.

Some valves are located under the gas tank, or below the cowl, and are hard to reach with the ordinary grinder; with this tool, however, an offset attachment is supplied, which enables the mechanic to grind the valve quite easily. This attachment also enables the operator to grind all the valves from the side of the engine, instead of from the top, if he prefers to work that way.

¶The Popular Mechanics Bureau of Information offers its free service to all readers of our magazine. Names and addresses of manufacturers and dealers in articles described, and any other details in our possession, will be promptly furnished, by addressing the Bureau.

ATTACHMENT CONVERTS LATHE INTO GRINDER

Garages, service stations, and repair shops will welcome a new grinding attachment for the lathe. The tool will do all



Grinding Crankshaft on Lathe, Using Ball-Bearing Throw Blocks

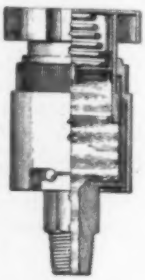
kinds of external grinding on any lathe, and may be used on lathes of 18-in. swing and over, for crankshaft grinding.

The unit consists of a sturdy, heavy-duty grinding stand with a base machined to fit the toolpost slot on the lathe carriage, and a rigid "whaleback" casting to carry the driving motor. The grinding wheels are carried on the spindle by locking collets, and hence may be removed from the spindle without the necessity of retruing when replaced; they may also be used at either end of the spindle. Collets of the same type are used to carry the special wooden pulleys used on the motor spindle, so that the correct pulley for each size of grinding wheel may be quickly put in place. The motor is adjustable on the whaleback, to regulate the belt tension.

When used for crankshaft grinding, a set of patented throw blocks, counterbalances, jigs, and a steady rest are furnished.

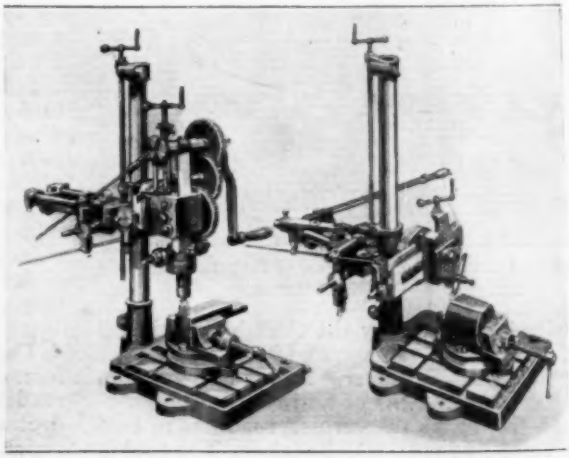
CAN'T CROSS THREAD ON NEW GREASE CUP

Users of grease cups—and their name is legion—will appreciate a novel form of cup recently patented. A spring-bayonet joint operates on a slight turn of the cap when removing or replacing the cap for filling. When the cap is in position, the threads are, for all practical purposes, engaged, and it is impossible to start the cap crooked. While the cup is self-feeding, the grease can be forced by hand to clear the passages of hardened grease and dirt before automatic feeding begins, thus insuring perfect lubrication. The cup is designed to feed about one-third of its capacity at each adjustment, to prevent emptying it completely. The spring-snap bayonet joint holds the parts firmly together.



COMPLETE MACHINE SHOP IN ONE TOOL

Work of immense variety may be done with a machine now in course of production by a French concern; it is really what its makers call it—"The Complete Workshop"—as, with a few simple changes in the position of the head, it may be used as a radial drill, shaper, miller, grinder, gear-cutter, slotter, and saw, adapted for either hand or power. The speeds may be changed, by gearing, for different varieties of work, the head running at from 20 to 2,200 r.p.m. The tool feeds are all automatic, and the tool head not only swings around the column, but also swivels on the cross slides, so that the work may be machined at any angle. The heavy base is provided with T-slots to accommodate a swiveling graduated vise, and work-holding clamps and fixtures. The space occupied is only 15 by 30 by 32 in., making the machine ideal for model makers, and small workshops.



Left, "The Complete Workshop" Set Up for Milling; Right, in Use as a Shaper